COMPARATIVE EVALUATION OF TUBAL PATENCY BY HSG AND LAPAROSCOPIC CHROMOPERTUBATION

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CERTIFICATE

This is to certify that the dissertation entitled **COMPARATIVE EVALUATION OF TUBAL PATENCY BY HSG AND LAPAROSCOPIC CHROMOPERTUBATION** is the bonafide original work of **Dr. V. GEETHA** in partial fulfilment of the requirements for **M.D. Branch – II (Obstetrics and Gynaecology)** Examination of the Tamilnadu Dr. M.G.R. Medical University to be held in March 2007. The period of study was from May 2004 to March 2007.

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DECLARATION

I, **Dr. V. GEETHA,** solemnly declare that dissertation titled, **COMPARATIVE EVALUATION OF TUBAL PATENCY BY HSG AND LAPAROSCOPIC CHROMO-PERTUBATION** is a bonafide work done by me at Govt. Stanley Medical College & Hospital during 2004-2007 under the guidance and supervision of **Prof. Dr. CYNTHIA ALEXANDER, M.D., D.G.O.**

The dissertation is submitted to Tamilnadu, Dr. M.G.R. Medical University, towards partial fulfilment of requirement for the award of **M.D. Degree (Branch – II) in Obstetrics and Gynecology.**

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CONTENTS

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INTRODUCTION

Being labeled infertile is devastating to a couple. For the vast majority of patients, infertility is a totally unexpected blow to their future. They become desperate for help to achieve their goal of pregnancy and a child. Many times the problem of infertility has been blamed as the main reason for marital breakdown.

Hence a thorough evaluation of infertile patients has 4 important goals.

1) To identify the cause of the infertility.
2) To provide a basis for potentially successful treatment options
3) To provide a realistic prognosis
4) To offer emotional support

The purpose of this study is to critically evaluate the usefulness of the 2 important diagnostic modalities namely the HSG and laparoscopy in the diagnosis of infertility as a means to diagnose and treat this malady to a successful conclusion.

DEFINITIONS

Infertility is defined as absence of pregnancy following one year of unprotected intercourse.

Primary infertility is applied to those couples in whom no previous pregnancies has occurred.

Secondary infertility : Atleast one previous conception has taken place irrespective of whether a live birth has occurred or not.

Fecundability is the probability of achieving pregnancy in a single menstrual cycle.

Fecundity is the probability of achieving a live birth within a single cycle.

Incidence

Infertility affects approximately 10-15% of reproductive age couples. The fecundability of normal couples has been estimated at 20-25%.

The approximate prevalence of the causes of infertility

Male factor	25-40%
Female factor	40-55%
Both	10%
Unexplained infertility	10%

The main causes for female fertility are

Tubal factors	36 - 44%
Ovarian Factors	26 - 44%
Endometriosis	1- 10%

(Source – FIGO manual 1990)

ROLE OF REPRODUCTIVE TRACT IN FERTILITY

Ovaries

The normal ovarian cycle involves 2 functions necessary for fertility which requires an intact hypothalamo pituitary ovarian axis.

1) Production of a mature oocyte
2) Synthesis of hormones necessary for the production of cervical mucus, a secretary endometrium and normal tubal transport.

Fallopian Tubes

The fallopian tubes functions more than a simple conduit for ova and sperm. The major physiological functions of tube.

1) Sperm transport
2) Ovum pickup
3) Adequate site for fertilization
4) Maturation of ovum
5) Embryo development
6) Transfer of conceptus to uterus

The mechanism of capture of oocyte by fallopian tube is facilitated by

1. Fimbriae – The fimbriae reach almost any point in ovary and allow efficient capture.
2. The ligamentous movements – The ligaments which surround the tube and ovaries exhibit contractions which are influenced by estrogen, norepinephrine, prostaglandins, and other substances.

3. Ciliary mechanisms – Numerous epithelial folds with predominance of ciliated cells beat in the direction of uterus. The cumulus mass of oocyte itself is probably critical for both ovum pickup and transport.

Uterus

The uterus has 4 important functions. It is clearly involved in

1) Sperm transport
2) Implantation
3) Supply of energy and nutrients to the growing fetus
4) Parturition

Intermittent uterine contractions occur during reproductive years. These appear to be stimulated by estrogen and modified by progesterone. Uterine contractions may be involved in rapid transport of sperm through the reproductive tract and plays a role in implantation. The function of uterus as an incubator for the growing fetus is well known.

The process of implantation requires adequate stimulation of the endometrium first by estrogen, then by combined activity of estrogen and progesterone.

Both endometrium and underlying myometrium must be anatomically and functionally normal to accommodate blastocyst attachment and nidation.

CAUSES OF INFERTILITY IN FEMALE

I) Ovarian Abnormalities

Ovulatory disorders as a cause of infertility include anovulation, Oligoovulation and luteal phase defect.

II) Tubal and peritoneal factors

Tubal and peritoneal factors account for upto 30-40% of female infertility.

Infertility may result from the following causes.

1) PID
2) Previous pelvic or tubal surgery
3) Secondary to appendicitis or diverticulitis
4) Endometriosis

III) Uterine abnormalities

1) Tuberculous endometritis
2) Asherman’s syndrome
3) Uterine myomas

IV) Cervical hostility to sperms

INVESTIGATION OF FEMALE INFERTILITY

With the development of newer therapies for infertility the chances for treating various infertility problems and the prospects of having a live child is improving. But with addition of new investigating modalities in the infertility armamentarium, the cost of investigating the infertile couple has proportionately increased. Infact many of the treatment failures are due to failure of compliance due to the final constraints of the couple.

Prior to investigating a patient, a complete history and a thorough physical examination is required.

I) History

The important points in the history noted in the female are :

1) Age of the patient
2) Duration of infertility
3) Detailed menstrual history
4) Prior pregnancies
5) Fertility in other relationships
6) Prior contraceptive use (OCPs, IUCDs)
7) Frequency of intercourse, sexual dysfunction
8) Gynecologic history (PID, Endometriosis, fibroids, cervical dysplasia)
9) Medical and surgical history
10) Medications
11) Previous tests and therapy for infertility

12)DES exposure

II Examination

General physical examination is performed with special attention to signs of endocrine diseases like

- Facial and body hair distribution
- Abnormal size or consistency of thyroid gland
- Pigmentation of skin
- Galactorrhoea

Bimanual pelvic examination to note down

- any uterosacral nodularity
- ovarian or tubal mass
- pelvic organ mobility
- uterine anomalies or leiomyomata
- Cervix for infection or stenosis

III Laboratory studies for blood sugar, urea

IV-Tubal patency tests

There are essentially 3 categories of tubal patency tests.

1. Where test medium is introduced trans-cervically

a) Laparoscopic chromopertubation

b) HSG

c) Methylene blue test – Where methylene blue injected into the uterine cavity can be detected in pouch of Douglas by Culdocentesis, if there is tubal patency.

d) Gas hydrotubation test – (Rubin's test)

After passage of 250-300ml of gas (Carbon dioxide) through the cervix, tubal patency was confirmed by patient complaining of abdominal and shoulder tip pain due to irritation of peritoneum by gas. Erect Xray abdomen reveals subdiaphragmatic gas in these patients. Kymography is an adaptation of this technique where the pressure of the insufflating gas is measured until the gas escapes into the abdominal cavity and the pressure suddenly falls.

c) Phenol sulphonaphthalene test (Spec test)

PSP when introduced into the uterus, is absorbed rapidly from the peritoneal cavity, but poorly from the reproductive tract. The presence of the chemical in urine will suggest tubal patency and can be shown by the urine developing a pink colour on adding 10% NaOH.

(Tests c, d, e are of historical importance.)

f) Investigation of tubal patency using ultrasonogram.

i) Saline Sonohysterogram Pelvis is filled with 300ml of normal saline and the mobility of the tube is assessed by transvaginal scan.

ii) Three dimensional hystero salpingo contrast sonography.

Two dimensional hystero salpingo contrast sonography is limited by the difficulty in visualizing the entire Fallopian tube owing to its tortuosity. This is overcome by means of 3D-hysterosalpingo contrast sonography.

ii) Air contrast Sonohysterography

After saline sonohysterography, small amounts of air were insufflated and the tubal passage of bubbles was monitered.

g) Radiolabelled gas

Xenon 133 is infused transcervically and the detection of radioactivity over the adnexae with gamma camera suggests tubal patency.

2. Direct cannulation of the fallopian tube

This can be performed hysteroscopically, under radiological control or under tactile control with ultrasonic confirmation of successful recannulation.

i) Selective Salpingography and Tubal Cannulation

It is the injection of contrast medium directly into the uterine tubal ostium with the use of special radio opaque cannulas inserted through the cervix.

ii) Salpingoscopy

It is the endoscopic examination of the ampullary portion of the tubal lumen during either laparoscopy or laparotomy.

iii) Falloposcopy

It is a transvaginal microendoscopic technique aimed at exploring the entire length of the tube especially the intramural and isthmic segment.

3. Tests dependant of particulate transport – Mainly to assess the epithelial ciliary funcion.

a. Microsphere migration – Active transport of radiolabelled microspheres from the cervical mucus through the upper genital tract. A gamma camera measures radioactivity. Patency is indicated on imaging by adnexal hotspots.

b. Starch test: Sterile specimen of starch deposited over fimbriae by culdoscopy of needling of the POD. After 24hrs, the cervical mucus is sampled with pipelle and the material stained with Iodine – presence of starch (detection of blue granules) indicates tubal patency.

V Cervical mucus studies

a. Assessment of quality / quantity of cervical mucus around ovulation along with spinbarkeit, viscosity, ferning, pH and cellularity.

b. Post coital test

c. Intracervical mucus penetration test

VI Assessment of uterine factors

a. Hysterosalpingogram

b. Hysteroscopy as a method of evaluation of uterine cavity and to confirm any suspected diagnosis or the extent of any pathology.

c. Laparoscopy

d. Endometrial biopsy at midluteal phase for evidence of ovulation

VII Transvaginal laparoscopy and hydrolaparoscopy

It offers an alternative to standard diagnostic laparoscopy in Subfertile Patients without obvious pelvic pathology. With a specially developed needle – trocar system, access to the pouch of Douglas is gained through a needle puncture of the posterior fornix under local anesthesia or sedation with the patient in a dorsal decubitus position using prewarmed Ringer lactate as a distension medium. It allows complete exploration of the tubo ovarian structures without supplementary manipulation. As the transvaginal route offers easy access to the tubes, ovaries and fossa ovaries, some operative procedures are possible. The disadvantage is absence of panoramic view.

VIII Tests for the prediction and detection of ovulation

a. To confirm ovulation

i. Basal body temperature chart

ii. Mid luteal serum progesterone level

iii. Endometrial biopsy

iv. Cytology of vaginal secretion

b. Diagnostic tests that predict time of ovulation

i. Basal Body Temperature chart

ii. Serial assessment of plasma or urinary LH levels

IX Hormonal assays

a. Serum T3, T4, TSH

b. Serum Prolactin] when

c. Serum Progesterone] indicated

Ideally a diagnostic laparoscopy with chromopertubation and endometrial biopsy in a single sitting would help the clinician to arrive at a conclusion for diagnosing the etiology of infertility. Barring a few cases of unexplained infertility and other miscellaneous cause, this is a cost effective method which globally encompases the evaluation of ovulatory, tubal and uterine factors. Moreover it reduces the patients waiting period after each diagnostic testing which itself is more psychologically taxing to a depressed couple.

Hysterosalpingogram

HSG is a contrast study of the uterine cavity and fallopian tube. HSG has replaced Rubin's tubal insufflation test as the most common method employed for diagnosing tubal patency because of the increased accuracy and the additional information gained from HSG. More over there are numerous reports of an increased pregnancy rate after tubal patency especially when an oil based contrast medium is employed for HSG. The proposed mechanism of benefit lies in the efficient flushing out of plugs.

Timing of HSG

HSG is an outpatient procedure. It is scheduled before ovulation usually between cycle days 5 and 11 to prevent dislodging and the possible irradiation of a fertilized ovum.

Prerequisites: No premedication is usually required for this procedure. But use of prohylactic antibiotics is advised in patients suspected to be at risk of post procedure pelvic inflammatory disease, especially if there is immunological evidence of chlamydia.

Procedure of HSG

5-10mg of diazepam with Inj Atropine is often helpful in an apprehensive patient. The procedure is explained to the patient and it is important to empty the bladder prior to HSG.

An emergency drug kit is essential in the rare occurrence of anaphylaxis due to intravasation of dye.

Use of NSAIDs 30mts prior to the procedure will decrease the pain that many women experience with HSG.

Conray 420 was the contrast medium used in our study

Patient is put in dorsal lithotomy position. A bimanual pelvic examination is done to find the position of uterus and to confirm any adnexal pathology. Posterior vaginal wall is depressed with sims speculum and the anterior lip of the cervix is caught with vulsellum. Air is displaced from the cannula with dye and the cannula (Leech-Wilkinsons) is screwed into the cervix. About 7-10ml of the contrast is injected slowly in the uterine cavity. An immediate film is taken. Another x-ray is taken 5 minutes after the first film. If no spill is seen but the uterine cavity is outlined another 10cc of the dye is injected and a third film is taken.

Contrast medium

Contrast media used for HSG are either oil based or water based with inherent advantages and disadvantages to each of them.

The original water soluble media were hyperosmolar and were associated with significant amount of pain both during and after the procedure.

A recent development in this field is the introduction of non-ionic media which are associated with significantly less pain or anaphylactic reaction than the earlier aqueous media.

The comparison of oil and water soluble contrast media.

	Oil soluble	**Water soluble**
1. Uterine image	Sharp	Less sharp
2. Ampullary rugae	Difficult to define	Easier to define
3. Viscosity	Viscous	Less viscous
4. Absorption	Months	Hours
5. Pain	Minimal	Significant
6. Granuloma formation	Rare	Very rare
7. Embolisation	Rare anaphylaxis	No major sequelae
8. Pregnancy rates after HSG	Doubles	No effect

Advantages of HSG

- Relatively inexpensive
- Simple means of tubal patency testing. Effective screening procedure
- Evidence of pathology within uterine cavity can be noted
- Position of any tubal occlusion noted
- No need for general anesthesia
- Possible role of increased pregnancy rates

Contraindications of HSG

- During and immediately before menstruation
- After curettage
- Active or recent PID
- Acute cervicitis or vaginitis

- Suspicion of Tuberculosis of genital tract
- Suspected ectopic pregnancy

Disadvantages of HSG

- Radiation exposure: may be a significant problem if the patient had an early pregnancy
- Abdominal pain
- Pelvic inflammatory disease: Overall risk of infection with HSG is <1%. But in a high risk population serious infection can occur in approximately 3 % of the cases
- Vomiting or vasovagal attack: occasionally tubal patency tests or associated uterine instrumentation can cause vasovagal attacks and shock.
- Generalised sensitivity reactions: Reactions may occur to chemicals such as Iodine, like Urticaria, asthma, Laryngeal oedema.
- Venous intravasation and embolisation of dye: Occurance of intravasation should always raise the possibility of endometrial Tuberculosis. Rarely intravasated dye may produce anaphylaxis.
- Oil granuloma formation: due to slow absorption of the dye
- Endometriosis

Interpretation

When fluoroscopy is not available, radiograph should be taken after the sequential injection of 3-5 ml of dye

Depending on the size of the uterus 8-10ml of contrast medium may be required

HSG often provides suggesting proximal tubal occlusion

The presence of mucosal rugae appears to be a favourable prognostic factor for subsequent pregnancy and the absence suggests deranged tubal epithelium

Distal tubal occlusion is suggested when there is partial filling of the fallopian tube but no peritoneal spillage

An irregular distribution of loculated contrast medium around the fimbriated end suggests periadnexal adhesions

A final radiograph demonstrating free intraperitoneal contrast material should be taken to document tubal patency.

Diagnostic fallacies in HSG

1. Mobile flap of thickened endometrium adjacent to the tubal ostium can prevent the passage of dye into the tube
2. Spasm of the tubal ostia may be mistaken for organic obstruction.
3. A full bladder may elevate the fallopian tube and may cause tubal blockage with spurious randomized appearance of hydrosalpinx
4. Inadequate contrast media may fail to delineate fallopian tube.
5. Too much contrast media instilled too quickly hides subtle abnormalities like
    a. Small polyp

b. Small leiomyoma

c. Synechiae

Laparoscopy as a diagnostic tool in the evaluation of subfertile women.

"Endoscopy is indicated in every infertile patient over the age of 30 or in any patient regardless of infertility for 3yrs or more"(Cohen)

Laparoscopy

Laparoscopy is the endoscopic examination of the abdominal and pelvic cavity.

The indications for laparoscopy in infertility include

Diagnostic

1. Abnormal tubal anatomy on HSG
2. History of pelvic surgery, PID, Endometriosis
3. Unexplained etiology after thorough evaluation
4. Second look laparoscopy after extensive surgery

Operative

1. Assisted reproductive technique
2. Reconstructive tubal surgeries
    a. Neosalpingostomy
    b. Fimbrioplasty
    c. Salpingoovariotomy
3. Uterine suspension

Contraindications to laparoscopy

As experience in laparoscopy has accumulated, the list of contraindications has diminished. However the gynecologist must be familiar with these contraindications to maximize safety and minimize procedure related morbidity.

1. Contraindications to General anesthesia – eg: severe cardiorespiratory diseases
2. Hypovolemic shock
3. Contraindications to pneumoperitoneum – eg: large hiatus hernia, cardiac diseases.
4. Unacceptably high risk of visceral injury
    a. Severe ileus
    b. Bowel obstruction
    c. Generalized peritonitis with ileus
    d. Large intra abdominal mass >10cm
    e. Extreme thinness
5. Extreme obesity
6. Inexperienced surgeon

Equipments for laparoscopy

1. Laparoscopes
    a. Straight forward
    b. Fore oblique

2. Pneumoperitoneum needle
    a. Verre's needle
3. Trocars
    a. Flapper valve
    b. Trumpet valve
4. Gas insufflation
5. Light sources
6. Cameras

Laparoscopic technique

Laparoscopy is done in secretory phase of the cycle. Patient is admitted a day before the procedure. tab. Diazepam 10mg, and soap and water enema is given on the previous night. Overnight starvation is advised.

Procedure is carried out under general anesthesia.

1. Patient positioning: patient is positioned with buttocks slightly protruding from the edge of the table and put in lithotomy position. This facilitates manipulation of uterine cannula and provides access to vagina. Arms should always be placed by the patient's side to allow a greater freedom of movement for the surgeon.

   Abdomen and perineum is painted and draped. Bladder catheterised. An initial pelvic examination is done to note the direction of the uterus.
2. Peritoneal access: Patient is then placed in Trendelenberg position. A small transverse incision of about 1 cm is made just below the

umbilicus. Abdominal wall is grasped and lifted as the verres needle is aimed towards the hollow of the sacrum. In obese patients, more vertical angle of the needle may be necessary to reach the peritoneal cavity.

Appropriate positioning of the needle can be verified by

- Placing a drop of water on the opening and the disappearance when the abdominal wall is lifted
- A syringe may be attached to the insufflating needle and any accidental injury to the organs may be demonstrated by aspiration of blood or gastrointestinal contents.
- Loss of liver dullness after passage of 1 litre of CO2 into the abdominal cavity is also reassuring.

Pneumoperitoneum is created with carbondioxide. For the positioning of the cannula the pressure of carbondioxide needed is 20mmHg. This pressure provides enough counter pressure against peritoneum facilitating trocar introduction.

3. Insertion of primary trocar

When adequate insufflation has been achieved, Verres needle is removed and trocar is inserted. The correct placement of trocar is confirmed by the escape of gas when the trocar is removed from the sleeve. The laparoscope is then inserted and connected to the light source. The correct intraperitoneal placement is then confirmed.

4. Diagnostic examination of the pelvis

- Initially a careful examination of the abdomen is done to ensure that inadvertent damage was not caused by trocar or Verres needle.
- Uterus is lowered and anterior uterus and uterovescial reflection are examined.
- Uterus is raised and posterior surface is examined.
- Adnexae is then thoroughly viewed. Ovary and pelvic side wall should be carefully examined for the presence of endometriosis. Lateral surface of ovary is examined, a preovulatory follicle/corpus luteum may be encountered.
- The fallopian tube is then inspected – proximal parts examined for nodules which may be indication of salpingitis isthmica nodosa.
- The tube is viewed in its entirety for the presence of endometriosis or adhesions.
- Fimbriae are examined to rule out fine fimbrial adhesions that may impede ovum pickup.
- Posteriorly the broad ligament and uterosacral ligaments are examined.
- Then chromopertubation is performed by injecting methylene blue dye into the uterine cavity and passage of dye observed from the fimbriated end.

Complications of laparoscopy

Early reports on the safety of laparoscopy estimated the incidence of complications to be 3-4 % with need for laparotomy in 0.73% of cases. With increasing experience, the incidence of complications has dramatically decreased.

Semm reported an overall complication rate of 0.28% in 8,943 laparoscopies. The most common complication being vascular injuries.

Daniell estimates the incidence of complications to be 0.5%. The complication rate in RSRM lying in hospital was reported to be 0.71% for laparoscopy.

The list of possible complication are:

1. Anaesthetic complications
    a. Cardiac arrhythmias
    b. Aspiration of gastric contents
2. Induction of pneumoperitoneum
    a. Extraperitoneal insufflation
    b. Pneumo – omentum
    c. Penetration of hollow viscus
    d. Vascular injury
    e. Gas embolism
    f. Subcutaneous emphysema
    g. Mediastinal emphysemas

3. Trocar insertion

    a. Vascular injury

        i. Abdominal wall (inferior epigastric vessels)

        ii. Aorta

        iii. Iliac vessels

        iv. Mesenteric vessels

        v. Omental vessles

b. Injury or penetration of a hollow viscus

The diagnostic and operative laparoscopy are safe procedures when guidelines are observed.

REVIEW OF LITERATURE

The challenges in reproductive medicine today require improvement in investigation and management of infertile patients. Endoscopic procedures as a diagnostic tool in the evaluation of infertile women being increasingly used world wide. Advances in the fertility treatment has progressed to a great extent in the correction of the various defects through the endoscopy route.

Historical mile stones of laparoscopy

1806 : First attempts to view the Pelvic Cavity of women was made by Bozzini

1869 : Pantaleoni used cystoscope to identity polyps in a patient complaining of utero vaginal bleeding

1901 : Kelling distended the abdominal cavity with air so that inspection of the abdominal organ made easy.

1910 : Jacobeaus introduced a Nitze Cystoscope into the Peritoneal Cavity and coined the term laparoscopy.

1912 : Nor dentoeft was the first to use Trendelenburg position.

1920 : Verres added the insufflating needle in the present form.

1925 : Zollikofer recommended the use of Co2 to insufflate the peritoneum.

1930 : Kalk was given the title of Father of internal Laparoscopy for his technical improvement of instruments.

1933 : Ferrers performed first adhesiolysis

1937 : Ruddock introduced diathermy coagulation

1944 : Decker introduced the scope through the vagina and termed as culdoscopy

1946 : Palmer used lithotomy Trendelenburg position and created a gaseous distension using co_2

1947 : Hopkins and Kampary introduced fibro optics

1950 : Fourestier introduced the concept of cold light for endoscopy.

1967 : Steptoe published the first English Language Laparoscopic monograph

1968 : First American one by Cohen

1970 : Safe effective methods of sterlisation using bipolar electrocautery thermocoagualtion clips and rings.

1974 : Semm reported the performance of Salpingectomy, Myomectomy, Oophorectomy ovarian cystectomy and Salpingostomy through laparoscopy.

1978 : Patrik and Steptoe used the laparoscope to find a mature egg and remove it with suction needle to produce first test tube baby.

In 1909 nemenow was first to suggest the introduction of Lugol's Solution into the uterine cavity in order to obtain x-ray film of the hollow organ.

In 1914 Rubin introduced the use of collagrol as contrast media for demonstrating tubal patency.

In 1921, Lipiodol was introduced by Sicard and Forestier double contrast hysterography by Decker etal (1958)

Colpohysterography (Calandra etal 1959) has been used when conventional hysterosalpingo graphy is impossible. Pelvi graphy described by Jefferis and Samual (1946)

Laparoscopy is presently the most commonly employed investigative procedure for the diagnosis of tubal and peritoneal causes of infertility.

According to S.Gupta (1989) who studied 300 cases by laparoscopy has proved a great value in infertile patients because of

- Low Complication rate
- It is conclusive easy to interpret finding
- Funcional tubal Spasm eliminated
- Unnecessary laparotomies avoided.

Sheith and Krishna (1979) showed that Laparoscopic findings were revealing and at times proved HSG findings shockingly wrong.

Laparoscopy has been continually compared with HSG in evaluating the tubal factor in infertility Frangheim in 1968 showed that there was a 50% disagreement between tubal insufflation and laparoscopy in testing the tubal patency.

Coltart in 1970 conducted HSG and laparoscopic chromopertubation in 36 patients. 18 of 36 patients who showed blocked tubes at HSG subsequently

at laparoscopy showed patency thus showing dissimilarity between these tests in 50% cases.

From 1973 – 1977 Miawi and Abdul Hadi investigated 352 patients with both HSG and laparoscopy. There was complete agreement in 57.65% Laparoscopy revealed unsuspected Pelvic Pathology in half of the patients who showed normal HSG.

In 1973 Iain E.Boyd Edmund M.Holf reviewed the record of 294 patients who had laparoscopy or laparotony following HSG. Single HSG seemed unreliable. Laparoscopy was a supplement to HSG and demonstrated Patency in tubes which radiologically had shown “Fill but no spill”

CJ Hutchins performed HSG and laparoscopy in 409 patients. Normal tubal patency was shown by both technique in 71.5% and abnormal tubal patency in 28.5%. According to hutchins, Laparoscopic assessment of tubal structure and patency was the most accurate method.

R.M.Sarogi and Ambiga have shown similarly between both tests in 79.1% of 120 patients. 30% showed various Pathological lesions which were missed at HSG by laparoscopy.

Sheith and Krishna studied 100 cases of infertility with HSG and laparoscopy in 1975. similarity between both the tests in 74% of patients. In 58% laparoscopy gave additional information like hydrosalpinx or pelvic tuberculosis.

Gupta and Agarwal from PGI chandigarh assessed the value of HSG in diagnosing tubal patency and peritubal adhesions.669 women were enrolled in their study. HSG revealed tubal blockage in 89.2%, uterine factors in 9.4 of cases Peritubal adhesions in 12.75% of cases.the findings were in agreement with HSG in 59.87% cases on laparoscopy.

In 1985 Collin Srinivasan conducted evaluation of the accuracy of tubal patency by insuffaltion, HSG and laparoscopy showed complete agreement in 70% of the cases. The percentage of blocked tubes by HSG and laparoscopy was 41.18% and 29.47% respectively and showed that laparoscopy was more accurate more informative and more conclusive when compare to others. According to her the discrepancies may be due

- Improper technique in performing HSG
- Injection of insufficient contrast media
- Low viscosity of methylene blue when compared to conray 420
- Tubal spasm during HSG

The additional advantage of laparoscopy is the discovery of underlying pelvic pathology like adhesion, PCOD, endometriosis and tuberculosis. According to Collin HSG still has a place in sterility investigation as it is Superior to laparoscopy in the diagnosis of intra uterine and endometrial lesion.

The Canadian infertility treatment evaluation study from April 1984 to March 1987 conducted by Collins et al concluded that Laparoscopy performed better than HSG as a predictor of future fertility. Occlusion detected on HSG

and laparoscopy showed a moderate agreement beyond chance. Hence for clinical practice laparoscopy can be delayed after normal HSG for atleast 10 month. Since the probability that laparoscopy will show tubal occlusion after a normal HSG is very low.

The Akush Ginekal (2000) evaluate the diagnostic accuracy of HSG and laparoscopy. Agreement between the results of both methods 66.4%. In HSG false negative of 10.4% and false positive of 23%. The greatest discrepancy between the HSG and laparoscopy was found in peritubal adhesion about 58.7%. They concluded that HSG is useful as primary screening procedure but laparoscopy provides more accurate assessment of tubal patency and peritoneal defects in the investigation of infertility.

Vasil Jevic etal (1996) studied the accuracy of both HSG and laparoscopy chromopertubation.The concordant findings by HSG and laparoscopy in the diagnosis of unilateral hydrosalpinx were found in 76.5% of case and bilateral hydrosalpinx in 70.4% of cases. The concordant finding by both methods in tubal blockage were found in 65.7% of cases. The concordant in the tubal patency in 65% of cases. However the advantage of laparoscopy in by visualization of pelvic adhesion, ovarian abnormalities, and which may be the cause of infertility only by using both procedure accurate results can be achieved in the tube, ovary and the uterus.

Servy ej etal (1978) studied 121 patients complaints of infertility subjected to HSG and laparoscopy. Normal patency with both technique in 71

patient (58.6%) False negative result of 19% False positive results of 7.4% with HSG.

Salata I etal (2003) assesing the tubal patency during HSG and laparoscopy in infertile women with endometriosis in 331 women. The presence of endometriosis confirmed during laparoscopy. The diagnostic compatibility of both these was 90.6% for uterus, 49.6% for both tube and 34.2% for only one tube. They concluded that the incorrect contrast passage through the fallopian tube and its increased pressure during HSG in women with the characteristic history and clinical symptoms can suggest endometriosis. In these cases laparoscopy is necessary.

Swartz p etal (1995) done a meta analysis of 20 studies comparing HSG and laparoscopy for tubal patency. Although HSG is of limited use for detecting tubal patency because of its low sensitivity, its high specificity makes it a useful test for ruling out obstruction.For peritubal adhesion HSG is not reliable.

Daliwal etal (1999) from PGI Chandigarh studied the value of HSG in diagnosing tubal patency and peritubal adhesion in 1000 women. The agreement of laparoscopy with HSG in 59.87% of cases.

Zuo W etal (1996) compare the diagnostic value of tubal insufflation, hydrotubation & HSG and laparoscopy in 258 women. The accuracy of hydrotubation (87.1%) and HSG (73%) significantly higher than that of insufflation (50%). when compared with laparoscopy tubal insufflation has no

longer its place in tubal patency due to its gross inaccuracy. Both hydrotubation and HSG can be used as a screening method. Laparoscopy is the most accurate method in assesing tubal patency as well as in pelvic abnormalities.

TSankora M etal (2000) studied in 120 patient and the presence of intrauterine filling defect on HSG is significantly associated with the presence of pelvic or peritoneal endometriosis.

Valentini AL etal (2000) conducted a study regarding improvement of HSG accuracy in the diagnosis of peritubal adhension. They have evaluated the presence or absence of radiographic signs of peritubal adhesions like convoluted tube, vertical tube, loculation of contrast medium in peritoneum halo effect and fixed lateral deviates of the uterus. using two different criteria for normal or abnormal. First criterion include no signs means normal and one or more signs means abnormal. second criterion include No sign or One sign mean normal and two or more sign as abnormal. The radiographic results compared with laparoscopy. The correlation with laparoscopy was not statistically significant in the first criterion. The second criterion improve the agreement but only in patent tubes. HSG accuracy in peritubal adhesion improved in patent tube by taking into account more than one of the reported radiographic sign.

Johnson etal (1994) studied the efficiency of HSG in evaluating endometriosis in 50 women. Laparoscopy was normal in 15 women and showed endometriosis in 35 patients Radiographic criterion for tubal

abnormality included incomplete or absent filling and ampullary dilatation or convulution. Radiographic sensitivity was 40% Specificity was 83% and positive predictive value 25% Endometriosis rarely causes radio graphic changes on HSG because of location of disease in the pelvis.

AIM OF THE STUDY

1. To compare the relative efficacy of HSG and Laparoscopy with Chromopertubation in the Diagnosis of tubal factors in infertile women.

2. To asses the reliability of individual techniques in such infertile women.

STUDY DESIGN

Prospective Comparative Study

METHOD OF ANALYSIS

Descriptive and Analytical Models

MATERIALS AND METHODS

90 infertile women attending the infertility clinic at Govt. R.S.R.M. lying- in Hospital were selected for this study. The study period was from April 2005 to July 2006 these patients were initially counseled along with their partners and a thorough history of both the partners was obtained followed by a general and pelvic examination of female partner.

Basic investigations like Hb%, urine analysis, Blood VDRL, Blood Sugar were done. A Mantoux test was performed in female partner whenever necessary. Patients were carefully selected after excluding the contra indications for HSG and by Laparoscopy.

The inclusion and exclusion criteria used were

INCLUSION CRITERIA

1. Primary infertility
2. Age between 20 and 40 yrs
3. Duration of infertility at least 1yr in younger age gp
4. Not suffering from other Medical illness
5. Normal seminal and other parameters in the partner

EXCLUSION CRITERIA

1. Age more than 40yrs and less than 20yrs
2. Duration of infertility less than 1 year in younger women
3. Secondary infertility
4. Active PID

5. Active cervical or vaginal infection

6. other medical and surgical disorders

INSTRUMENTS USED

For Hystersalpingogram

1. Leech – Wilkinson Cannula

2. Conray 420 as contrast medium

For Laparoscopy

1. Karl Storz Straight forward Laparoscopy

2. Carbon dioxide as distending medium for laparoscope

3. Methylene blue dye

4. Light source for Laparoscopy

METHODS

After initial evaluation of the patient and her partner HSG was performed between 9^{th} and 11^{th} days of the cycle. It was done as an OP procedure No severe complications were met with barring few cases of low abdominal pain in the study.

Laparoscopy was done in the secretory phase of the menstrual cycle patient was admitted a day before the procedure. All pre operative preparations were done. Laparoscopy was done under General anaesthesia A thorough inspection of the uterus, tubes, ovaries and cul-de-sac was done. Findings noted chromopertubation was done by injecting the dye and the nature of the spil visualized. The site of block, hydrosalpinx, and other pathology were noted.

At the end of the procedure an endometrial biopsy was taken for dating and to rule out Tuberculosis. The laparoscope was then withdrawn after the completion of the procedure and carbondioxide let out. Patient was transferred to post operative ward after checking pulse, BP, respiration. She was allowed oral feeds after 6 hours and was discharged after 24 hours.

RESULTS AND OBSERVATIONS

This study was conducted in Govt. RSRM lying-in Hospital. 90 infertile women were evaluated for this study. HSG and diagnostic Laparoscopy with chromopertubation was done in all 90 patients.

TABLE 1
AGE DISTRIBUTION OF INFERTILITY

Years	Number	Percentage
20 – 25yrs	53	58.9%
25 – 30yrs	25	27.8%
30 – 35yr	11	12.2%
>35y	1	1.1%

All our patients were categorized according to the age distribution which shows that nearly 83% of the patients were within 30yrs age group. Patients who sought medical advice after 35 years were very minimum of 1 which accounts to 1% of the patients.

TABLE 2
DURATION OF INFERTILITY

Years	Total Numbers	Percentage
1 – 15yrs	68	75.6%
6 – 10	20	22.2%
>10	2	2.2.%

The analysis of duration of infertility shows that $3/4^{th}$ of patients (75.6) sought medical advice with in 5yrs of Marriage. patients with duration of infertility more than 5 yrs contributed to only 22%. Only 2 patient in our study group had a duration of infertility for more than 10yrs.

In all the 90 patients, an initial HSG was performed to evaluate the tubal patency and uterine factors. The findings were recorded as below

TABLE 3
FINDINGS IN HSG

Tubal Patency	**Number**
Patent tubes	42 cases
Blocked tubes	48 cases
Uterine Pathology	**Number**
Normal	79
Synechiae	8
Bicornuate uterus	1
Arcuate uterus	2

TABLE 4
PATHOLOGIC CAUSES OF INFERTILITY AS DIAGNOSED BY HSG

Pathology	**Number**
Tubal Pathology	48
Uterine Pathology	11
Both Tubal and Uterine Pathology	6

Thus with HSG it was found that 48 patients had tubal pathology, 11 patients had uterine pathology. Of those 11 patients with uterine pathology, 6 patients with synechiae had both tubal and uterine pathology. The remaining 5 had only uterine pathology and tubes were patent in them.

TABLE 5
PERCENTAGE DISTRIBUTION OF TUBAL PATENCY BY HSG

	Number	Percentage
Patent tubes	42	47%
Blocked tubes	48	53%
Unilateral block	13	
Bilateral block	35	

The tubal picture of these patients showed 42 cases with patent tubes (47%) and number of blocked tubes were found to be 48 (53%)

The tubal blockage was either unilateral or bilateral. In our series of 48 patient with blocked tubes in HSG, 13 patients had unilateral block.

TABLE 6
SITE OF TUBAL BLOCK IN HSG

Proximal tubal block	8
Block at midsegment	24
Fimbrial block	16

The site of tubal occlusion in all those blocked tubes shows that more number of tubal blockade was seen in midsegment of the tube (24 cases) followed by Fimbrial block in 16 cases.

Diagnostic Laparoscopy with chromopertubation was performed in all 90 patients and the findings were recorded.

TABLE 7
LAPAROSCOPIC FINDINGS

Uterus	Normal	82
	Subserous Fibroid	5
	Bicornuate uterus	1
	Arcuate uterus	2
Tubes	Normal	65
	Peritubal adhesions	22
	Tubo ovarian mass	2
	Hydrosalpinx	1
Ovaries	Normal	74
	Streak	1
	Cystic	7
	Tubo ovarian mass	2
	Endometriotic nodules	6
Pouch of Douglas	Normal	84
	Adhesions	2
	Endometriotic nodules	4
Chromopertubation	Patent tube	56
	Blocked tube	34
	Unilateral block	12
	Bilateral block	22
	Cornual block	5
	Mid position block	20
	Fimbrial block	9

TABLE 8
HISTOPATHOLOGY OF ENDOMETRIUM

Secretory Endometrium	61
Proliferative Endometrium	26
Atropic Endometrium	3

The possible factors responsible for infertility based on diagnostic laparoscopy chromopertubation and endometrial biopsy are

TABLE 9
CAUSES OF INFERTILITY

Tubal factors	34
Uterine factors	7
Ovarian factors	26
Endometriosis	6

The complete evaluation of tubal, peritoneal and uterine factors by laparoscopy focused upon the various factors responsible for infertility. Thus the tubal factors were suspected in 34 cases. Uterine pathology contributed to 7 cases. The possible role of anovulation as confirmed by histopathological examination report in 26 cases. Endometriosis accounted for 6 cases where laparoscopy was instrumental.

TABLE 10
PATENCY OF TUBES AS DIAGNOSED BY LAPARASCOPIC CHROMOPERTUBATION

Laparoscopic chromopertubation	Number	Percentage
Patent	56	62.2%
Blocked	34	37.8%

The evaluation of tubal factors after laparoscopic chromopertubation shows that the tubes were patent in 56 patients while tubal blockage was noted in 34 patients as compare to 48 and 42 in hysterosalpingography

TABLE 11
COMPARISON OF TUBAL PATENCY BY HYSTEROSALPINGOGRAPHY AND LAPAROSCOPIC CHROMOPERTUBATION

	Hysterosalpingography		Laparoscopic Chromopertubation	
	Number	Percentage	Number	Percentage
Patent tube	42	47%	56	62.2%
Blocked tube	48	53%	34	37.8%

When comparing the tubal patency in hysterosalpingography and laparoscopic chromopertubaion, it can be seen that more than half of the tubes were found to be patent in laparoscopic chromopertubation (62.2%) where as it was only 47% on hysterosalpingography. Blocked tubes constituted 37.8% in laparoscopy and when compared to hysterosalpingography the numbers were less.

TABLE 12
COMPARISON BETWEEN HSG AND LAPAROSCOPIC CHROMOPERTUBATION IN THE SITE OF TUBAL BLOCKADE

	Proximal	Midsegment	Fimbrial end
HSG	8	24	16
Laparoscopy	5	20	9

The site of tubal blockade is mainly the mid segment as revealed by both diagnostic methods. Laparoscopy could demonstrate only half of those Fimbrial blocks which were diagnosed by HSG.

TABLE 13
CORRELATION OF HSG FINDINGS WITH LAPAROSCOPIC CHROMOPERTUBATION

	HSG	Laparoscopic Chromopertubation	
		Confirmation	Disagreement
Patent tube	42	42	-
Blocked tube	48	34	14
Additional Pathology diagnosed during laparoscopy in those cases with patent tubes are Hydrosalpinx - 1 Tubo ovarian mass - 2 Peritubal adhesion - 5 Total - 8			

With regard to the patency of the tube HSG and laparoscopy has a correlation of 75% while blocked tubes have an agreement of 71%.

Hence it can be seen that all those patients with patent tubes in HSG were confirmed by laparoscopic chromopertubation. More number of tubes were found to be patent in laparoscopy when compared to HSG. This increase

in the number of patent tubes may be due to release of tubal spasm by anesthesia during laparoscopic chromopertubaion.

TABLE 14
SHOWING COMPARATIVE ANALYSIS OF TUBAL PATHOLOGY BETWEEN HSG AND LAPAROSCOPY

HSG	Tubal Pathology as diagnosed by laparoscopy	
	Tubal Pathology	Normal tubes
Blocked Tubes	34	14
Patent Tubes	8	34

The sensitivity of HSG as a Screening test is - 81%

Specificity - 71%

Percentage of false positive - 29%

Percentage of false negative - 19%

The initial evaluation of tubal pathology in infertile women by HSG shown a sensitivity of 80.9% and a specificity of 70.8% A false positive rate of 28.16% is seen which implies that whenever a tube is found to be blocked, a laparoscopic chromopertubation has to be done to diagnose or refute the pathology.

DISCUSSION

This study was conducted at RSRM lying in Hospital in 90 patients attending the OP from April 2005 to July 2006. This compared the efficacy of HSG with Laparoscopy as a diagnostic tool in evaluating tubal patency in infertile women. The relative merits and demerits of both the procedures were also analysed.

Table 1

All the patients selected for the study were distributed according to their age. The reduction of fertility and fecundity with advancing age has been well documented in various studies.

The influence of age on cumulative pregnancy rate in a study conducted by Hendershot et al (1982) is depicted here

Age group (years)	Conception in 12 months (%)
20 – 24	86
25 – 29	78
30 – 34	63
35 – 39	52

In their study it was found that the fecundity of women is maximum around the age of 25 years.

In our study nearly 85% of patients were with in 30 year of age. Evaluation was done in only one pt with age greater than 35 yr.

Conceiving at an advancing age also causes an increased risk of congenital malformation in the foetus. In French study the pregnancy rate below the age of 31 was 74%. This decreased to 62% at age 31 to 35% and to 54% when older than 35. An American study demonstrated a similar relationship with age. The probability of having healthy baby decreased 3.5% per year after age 30. A woman age 35 had 50% chance of having healthy baby compared to woman of 25 years.

Table 2

Similar to the distribution of infertility, the duration of infertility also has a bearing in the management. Majority of the patients in our study sought medical advice within 5 yrs of practising unprotected coitus. Only 2 patients found to have a duration of infertility for >12yrs. Infertility can place Psychological stress on the couple to the extent that Psychological intervention may become necessary.

Infertility is defined as the inability to conceive during 1yr of un protected intercourse. In Guftmancher reviewed the conception time for 5574 fertile woman 14.6% of fertile women did not become pregnant during 1 year of un protected intercourse. All of these women in this study ultimately became pregnant but 6.6% of the fertile woman required more than 2 year to do so.

Month to conception	Conception rate (%)	Cumulative Preg rate (%)
1	32.7	32.7
2-3	24.3	57.0
4-6	15.1	72.1
7-12	13.3	85.4
13-24	8.0	93.4
>24	6.6	100

Various studies have reported the incidence of tubal factors as a cause of female infertility in about 30-40% of cases. According to FIGO Manual of 1990 the causes for female subfertility are tubal factor (36-44%) ovarian factors (26-44%) Endometriosis (1-10%) The 2 commonly used tests for the diagnosis of tubal patency are HSG and laparoscopic chromopertubation. HSG has the additional advantage of detecting anomalies of uterine cavity where as laparoscopy provide an overall picture of the pelvic structure ovary pathology along with tubal patency and architecture.

Table 3 & 4

The findings in HSG in our study showed 48 patients to have blocked tubes out of 90 patient. uterine pathology was seen in 11 patients accounting for 12.2% cases of infertility. Among 6 patients with blocked tubes showed co existing pathology suggestive of intrauterine synechiae.

Opshal et al (1993) studied the predictive value of HSG in tubal and peritoneal factors in 756 patients. HSG results were classified as normal, abnormal (bilateral distal tubal obstruction) or suspicious (all others).HSG was

confirmed surgically in 96.6% of normals, 63.1% of suspicious and 95.7% of abnormal. Associated Moderate – severe pelvic disease was found in 16.2% of normal, 53.9 of suspicious and 81.7% of abnormal. Abnormal HSGs are highly predictive of severe pelvic disease and does not require laparoscopy. Patients with suspicious HSG frequently have normal tubes but poor predictive value for tubal or associated pelvic disease so requiring confirmatory laparoscopy. Normal HSG have a high negative predictive value which is high enough to warrant diagnostic laparoscopy.

Either a water soluble contrast medium or oil based contrast medium has advantage .water soluble contrast medium is more rapidly absorbed and no risk of lipid embolism or lipid granuloma formation oil based dyes are associated with less uterine cramping, better resolution of tubal architecture and a higher post procedure pregnancy rate. A recent update of a 1994 meta analysis has found that the use of oil soluble medium to flush the tubes during HSG Significantly increases subsequent pregnancy rates (OR, 1.8, 95% CI 1.29 to 2.50).

Table 5 & 6

Nearly half (53%) of the patients were found to have blocked tube by HSG. Shah et al (2005) studied the accuracy of HSG to establish tubal patency, site of occlusion in 50 patients. HSG diagnosed bilateral proximal in 15 and bilateral distal in 13 patients and mixed in five cases. Diagnostic laparoscopy confirmed the above sites of block in nine, seventy one and three cases. In

comparison, HSG demonstrated 70% specificity for accurately diagnosing proximal tubal occlusion.

The site of block has an important bearing especially when surgical correction is planned for the patient. Though IVF – Embryo transfer has provided a therapeutic alternative for those with bilaterally blocked tubes, reconstructive tubal surgery still has a role particularly in those settings where the most modern infertility treatments are not available. The live birth rates was reported to be high in cases of tubo-tubal anastomosis when compared to fimbrioplasty. Moreover the incidence of ectopic pregnancy is also increased in cases of surgeries done to correct distal tubal occlusion.

Patton and colleagues in a series of microsurgical fimbrioplasties in 40 patients reported total intrauterine pregnancy and ecotpic pregnancy rates of 63% and 8% respectively after 24 months follow up. The results of microsurgical tubotubal anastomosis has shown an intra uterine pregnancy rate of 63% and ectopic pregnancy rates of 3.7% (Tebelde et al 1990)

Likewise tubo cornual anastomosis also has not shown encouraging result. The published series report live birth rates between 33% to 56% and ectopic pregnancy rates between 5% and 7% (Donnez etal 1986)

Majority of the patients studied in our group had mid segmental block (24 patients) followed by 16 patients with fimbrial block. Proximal tubal block accounted for 8 patients only.

Table 7, 8 & 9

The use of laparoscopy and chromopertubation will show a better picture in the evaluation of infertility. Diagnostic laparoscopy and chromopertubation and endometrial biopsy was done in all 90 cases for whom HSG was done.

In our study we can find that tubal factors were seen in 38% of cases while anovulation as a cause of infertility was seen in 26 cases as suggested by histopathological examination 2 cases of Tubo ovarian mass and 1case of hydrosalpinx were additionally diagnosed in laparoscopy in those with a patent tube in HSG. More over 22 cases of peritubal adhesion were noted of these 5 had shown patent tubes. Endometriosis was diagnosed in 6 cases by laparoscopy (6.7%). 7 cases of cystic ovaries were diagnosed and all these showed anovulation by histopathological examination. The other pathologies seen were subserous fibroid in 5 cases bicornuate uterus in one patient and arcuate uterus in 2 patients. More than one factor were seen in some patients.

Donnez etal 1982 done a study to find the incidence of pathological factors not revealed by HSG but disclosed by laparoscopy in 50 infertile women. The study shows an agreement in 90% of cases. In total 980 tubes examined, HSG identifies fimbrial conglutination in 79 tubes (8%) compared to 154 tubes (15.7%) by laparoscopy. HSG diagnose 68.8% of the peritubal adhesion confirm by laparoscopy. Endometriosis in 124 women and isolated periovarian adhesions in 48 women by laparoscopy.

Lavy etal 2004 assessed the diagnostic benefit of laparoscopy in infertile women with normal HSG in 86 patients. Laparoscopy may be omitted in women with normal HSG since it was not changed the original treatment indicated by HSG in 95% of patients. However laparoscopy should be recommended in cases with suspected bilateral occlusion on HSG since it altered the original treatment plan in 30% of patients from IVF to induction of ovulation with IUI

HSG VERSUS DIAGNOSTIC LAPAROSCOPY FOR PERITUBAL ADHESION.

Study	No. of patients	Prevalence	Sensitivity	Specificity
Maathun etal	146	43	0.51	0.73
Hutchins	316	12	0.39	0.99
Montanarietal	54	22	0.17	0.95
Duff etal	33	33	0.64	0.77
Ismajovich	162	58	0.77	0.50
Reshef etal	215	35	0.13	0.87

Table 10, 11, 12 & 13

The evaluation of tubal patency by HSG and laparoscopic chromopertubation showed that only 34 patients out of 90 had blocked tubes as compared to 48 patients who had blocked tubes in HSG.

Thus laparoscopic chromopertubation showed 62.2% of the cases to have patent tubes while analyzing the site of blocks, more number of fimbrial

blocks were seen in HSG when compared to laparoscopy (16 VS 9) The reasons might be

1) The fact that it was only a spasm that was mimicking a block in HSG.
2) Release of flimsy peritubal adhesion either inadvertently or intentionally thereby facilitating the free flow of dye through fimbria
3) A small fimbrial phimosis could easily be overcome by anesthesia and forcible injection of methylene blue.

This study clearly shows that with laparoscopy the fertility can be better assessed than HSG.

Gasparov etal 1990 done a comparative study of the diagnostic value of HSG and laparoscopy in 100 women and laparoscopy have been shown to be the best test of tubal abnormalities.

Hutchinsons 1977 etal assessed the tubal patency in HSG and diagnostic laparoscopy in 409 patients. Peritubal adhesion were detected by HSG in only 18 of the 54 cases where they were demonstrated by laparoscopy. Laparoscopy gave much useful information either at variance with or in addition to that yielded by HSG.

From the data the correlation between laparoscopic chromopertubation and HSG was found to be 75% in diagnosing patent tubes while the agreement is 73% in the diagnosis of blocked tubes. Laparoscopy was better than HSG in defining the tubal architecture in those cases having a patent tube by HSG. 5 patients in whom patent tubes were seen in HSG showed peritubal adhesions

by laparoscopy. Additionally 2 cases of Tubo ovarian mass and one case of hydrosalpinx were also missed by HSG. Laparoscopy was better than HSG in defining the tubal architecture even in those cases found to be having a patent tube in HSG.

Agreement between HSG and Laparoscopy in various series

Frang enheim (1968)	50%
Coltart (1970)	50%
Dvignon (1972)	70%
Collen Srinivasan (1985)	70%
C.J.Hutchin	71.5%
Sarogi & Ambiga (1975)	79.1%
Gupta etal (1999)	59.8%
Sheith and Krishna (1979)	74%
Tolino (1983)	74.19%
Dhaliwal etal (1999)	59.8%
Vasil Jevic Metal (1996)	65%

Therefore laparoscopy and HSG are complementary to one another in diagnosing tubal and peritoneal factors and any infertility work up gives a more definite diagnosis when HSG findings was supplemented with laparoscopy.

Table 14

The results of the study shows that HSG has a sensitivity of 80.9% in diagnosing tubal pathology while the specificity is 70.8%

Otubu et al (1990) had shown an accuracy of 91% and false positive rate of 9% in their study comparing HSG and laparoscopy in evaluation of tubal pathology.

Study	Sensitivity	Specificity
Duignan etal	85	89
Huchins	77	90
Dulfetal	67	84
Loyetal	80	72
Montamari etal	83	89
W H O	82	55
Ismajovich etal	74	68
Lasala etal	64.5	63.3
Bacevac etal	78	96
Swart etal	65	83
Piyavisetpat etal	74.6	64
Stan etal	72.9	55.7

Shalev J et al 2000 evaluated the effectiveness of modified HSG using <3 ml amount of contrast medium followed by injection of saline to minimize the adverse effects associated with the procedure in 78 patients. (Study40 patients and control 38 patients) control group underwent HSG with undiluted contrast medium. Uterine cavity and tubal patency were properly visualized during modified HSG. Saline pushed the contrast medium successfully from

the uterine cavity through the fallopian tube. The study group reported significantly less pain.

Our study showed the percentage of false positives to be high (28.16%) Hence when HSG finding of a patent tube is seen, one can wait for 3 to 6 months with additional advantage of hoping for increase in fertility but it is not so in cases of blocked tubes which requires an early laparoscopy to confirm the diagnosis and for follow up action.

Therefore it has been demonstrated from the study that HSG and laparoscopy with chromopertubation should be considered complementary to each other. Each have the merits and demerits of their own. Although laparoscopy was better than HSG as a predictor of future fertility, it should not be considered as the perfect test in the diagnosis of tubal pathology. For clinical practice, laparoscopy can be delayed after a normal HSG for atleast 6 months since the probability that laparoscopy will show tubal occlusion after a normal HSG is very low.

RESULTS IN OUR STUDY

		Results	**Estimate 95% CI**
Sensitivity	-	81%	66% - 91%
Specificity	-	71%	56% - 83%
Positive Predictive value	-	71%	56% - 83%
Negative Predictive value	-	81%	66% - 91%
False Positive	-	29%	17% - 44%
False Negative	-	19%	9% - 34%
Correct classification		76%	65 - 84%
Kappa Statistics	K=0.51	Moderate Agreement	

Probability = 0.001

CONCLUSION

90 infertile women were evaluated for a period from April 2005 to July 2006 at Govt. R.S.R.M. lying-in Hospital. HSG was done in all these 90 patients and all underwent laparoscopy with chromopertubation for assessment of tubal patency and uterine pathology. The study analysed the efficacy of HSG versus laparoscopy and compared the correlation between the 2 methods.

The results of the study showed that in diagnosing a patent tube the correlation between HSG and laparoscopy is 75% for patent tubes and 73% for blocked tubes.

The sensitivity of HSG in diagnosing tubal pathology was 81% while specificity is 71%. A high false positive rate of 29% was shown in this study.

To conclude, HSG has a reasonably good sensitivity and specificity in diagnosing tubal pathology of infertile women. But given the high rate of false positive diagnosis of tubal pathology (29%) in HSG, a follow up laparoscopy is warranted.

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PROFORMA

Name : Age} Husband Occupation} Husband Husband:
} Wife : } Wife :]
Address :

IP No : Unit:
Married - No.of years : Consanguinity : Yes/No
Duration of infertility :

Female :
Age of menarche :
Shortest cycle in the past one year :
Longest cycle in the past one year :
Menstrual category :
(1) Regular (2) Menorrhagia (3) Oligomenorrhoea
(4) Polymenorrhoea
Secondary amenorrhoea : Yes/No
Previous examination or treatment of infertility : Yes/No
If yes, specify :
Any contraception used : Yes/No
If Yes, specify :
Any History of the following:
(1) PID (2) STD (3) TB (4) Surgery
(5) Long term use of medication
Dyspareunia – Absent - Superficial – Deep
Family h/o : TB; DM or HT
Yes/No
General Examination
Normal Abnormal
Breast
Pubertal stage (Tanner 1- 5)
Discharge present : Yes/No

Ext. Genitalia – Normal/Abnormal
Speculum Examination
Bimanual Pelvic Examination :

Uterus : (1) Normal (2) Enlarged
(3) Atrophic (4) Absent

Position : AV/RV/Axial

Uterosacrals : (1) Not Palpable (2) Thickened
(3) Nodular (4) Tender

Investigation

Semen analysis :
VDRL :
Blood Sugar :
Mantoux:

(1) Hysterosalpingogram
a. Uterus
b. Tubes
c. Spill

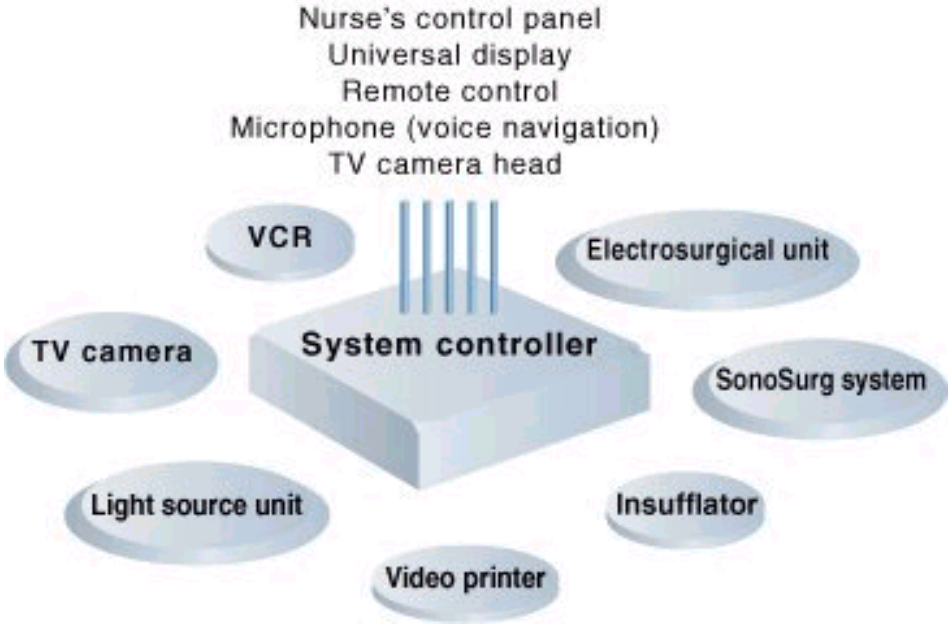
(2) Diagnostic Laparoscopy
a. Uterus
b. Tubes
c. Adhesion
d. POD
e. Endometriosis
f. Ovaries
g. Any Tubercles
h. Chromopertubation

(3) Hysteroscopy
a. External Os
b. Cervical Canal
c. Internal Os
d. Uterine cavity
e. Ostia

(4) Endometrial Biopsy

Treatment :

Follow Up :


Nurse's control panel
Universal display
Remote control
Microphone (voice navigation)
TV camera head
VCR
Electrosurgical unit
TV camera
System controller
SonoSurg system
Light source unit
Insufflator
Video printer

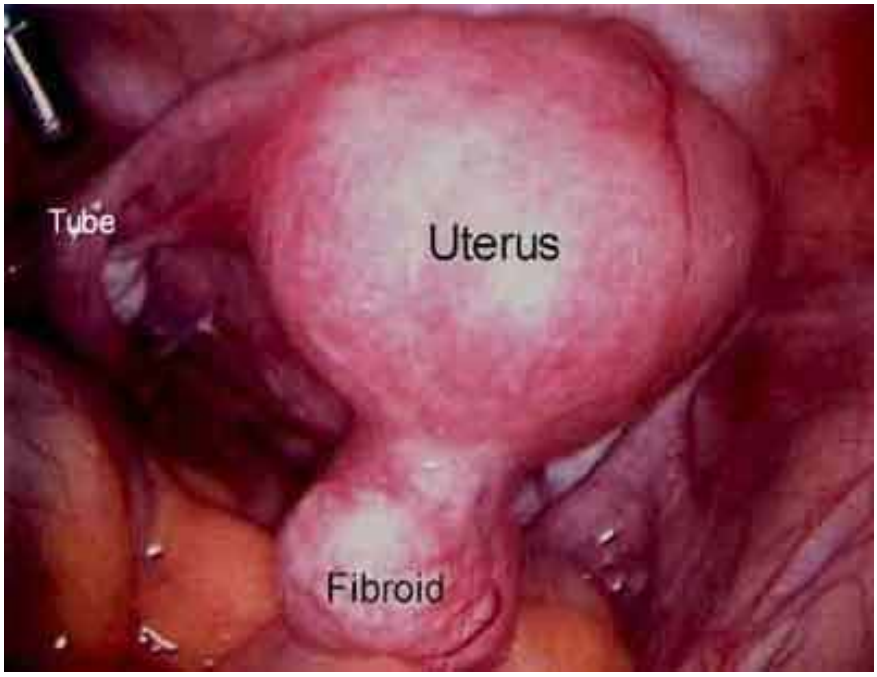
ELECTRODES

LAPAROSCOPE

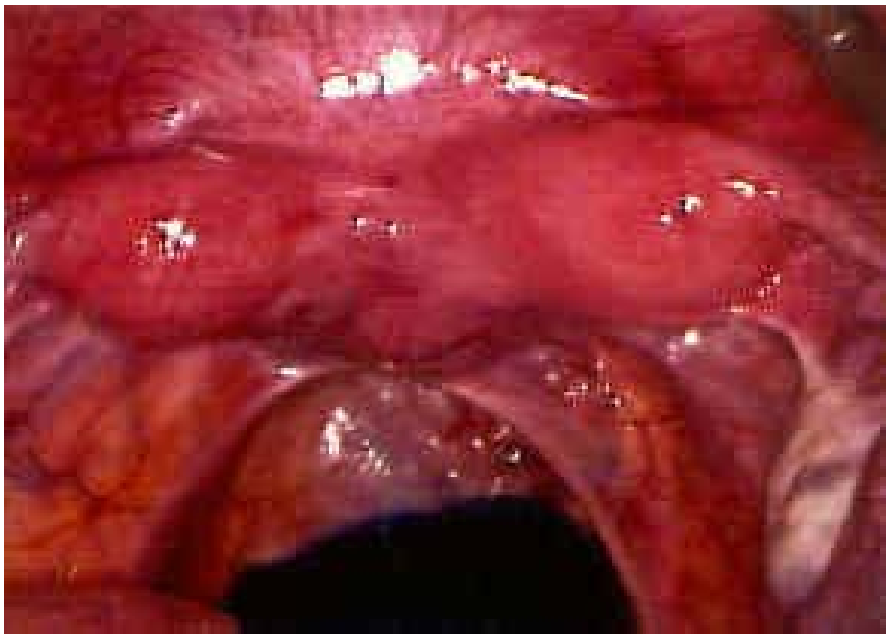
TROCAR

BIPOLAR FORCEPS

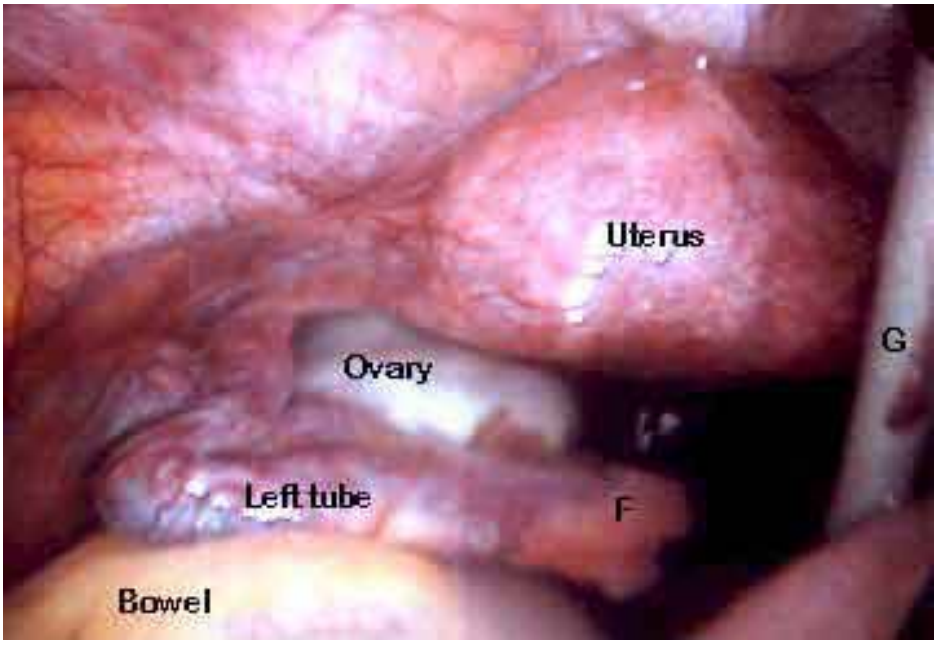
PEDUNCULATED POSTERIOR MYOMA

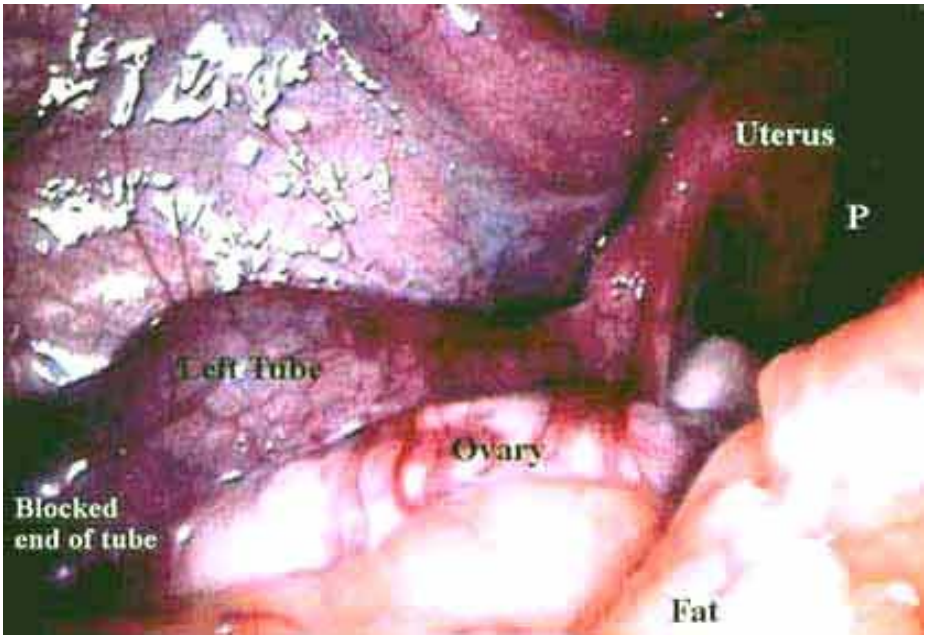


BICORNUATE UTERUS

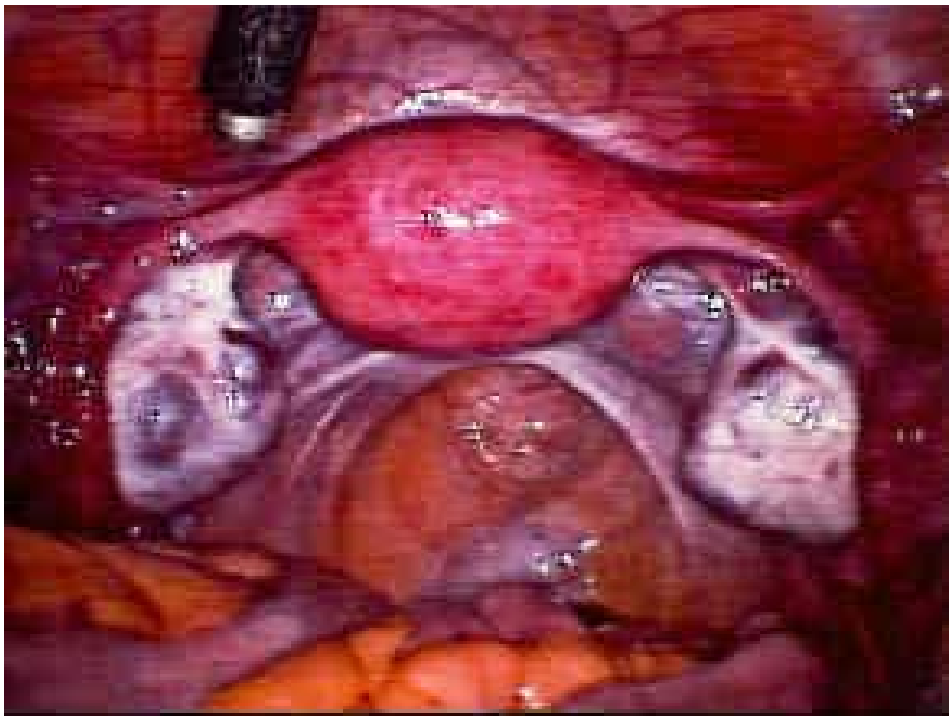


COMPARISION OF NORMAL TUBE AND BLOCKED TUBE

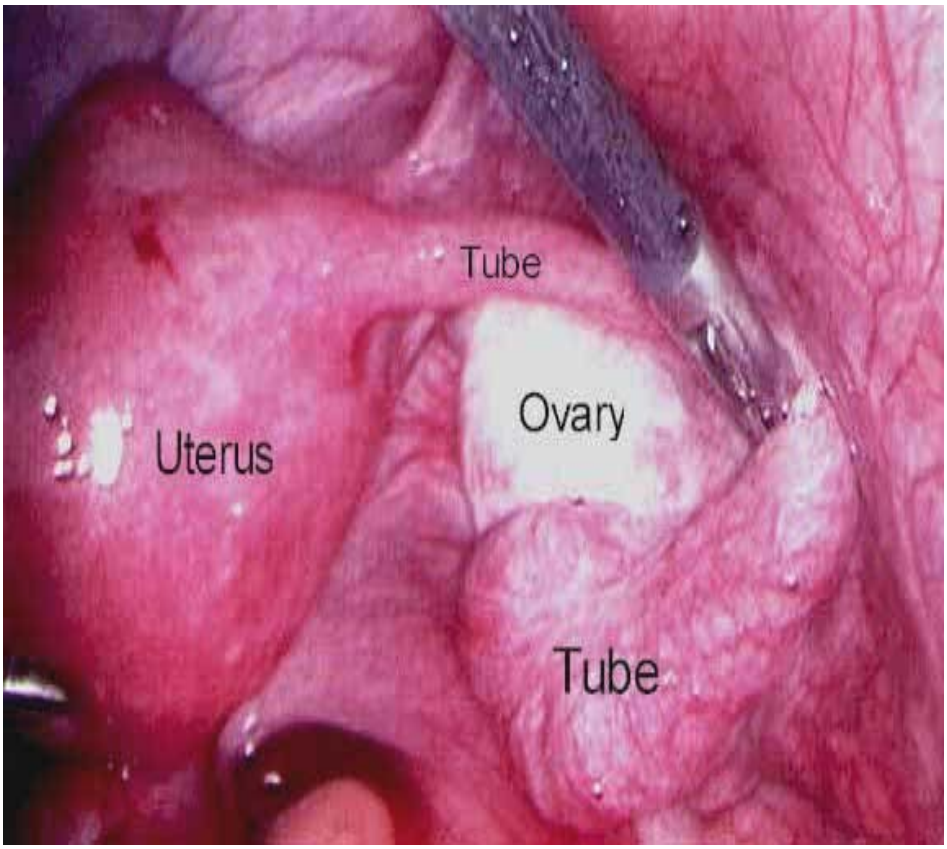




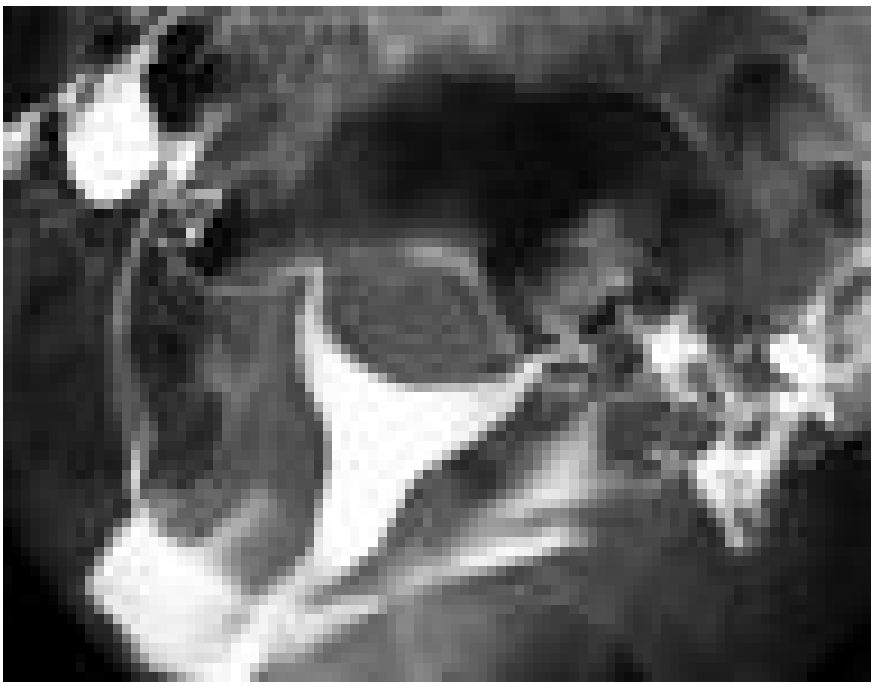
NORMAL PELVIC ANATOMY

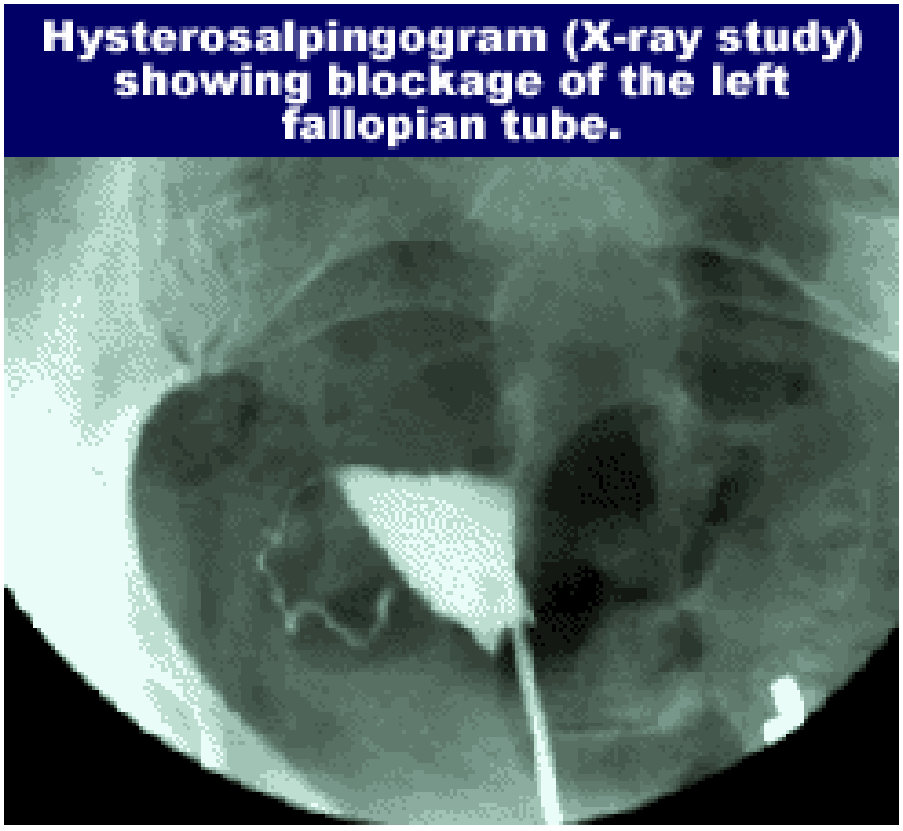


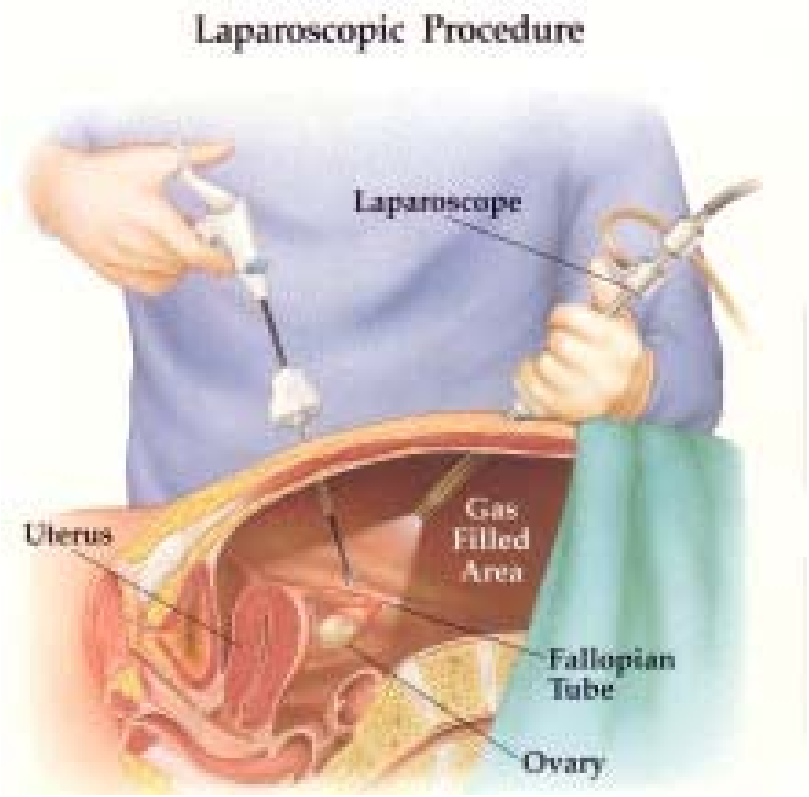
RIGHT TUBE BLOCKED AND STUCK IN SCAR TISSUE TO THE SIDE OF THE OVARY



ARCUATE UTERUS

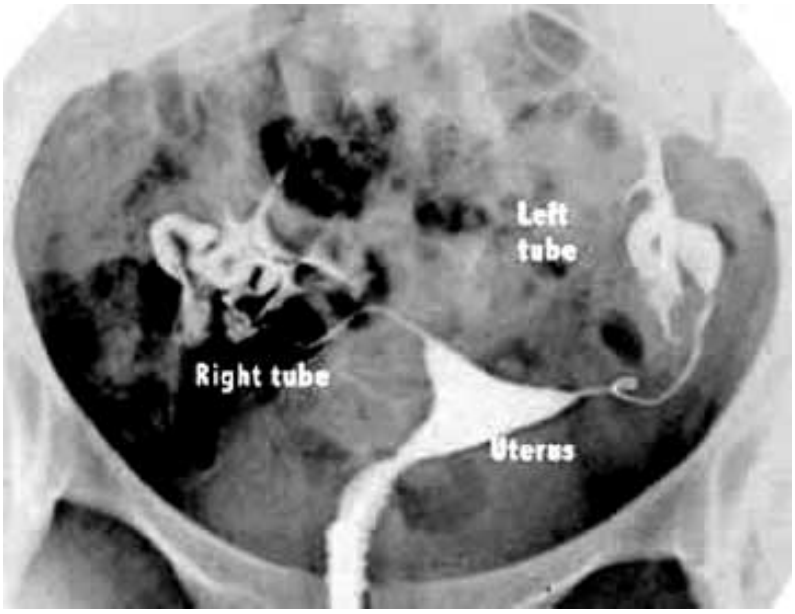




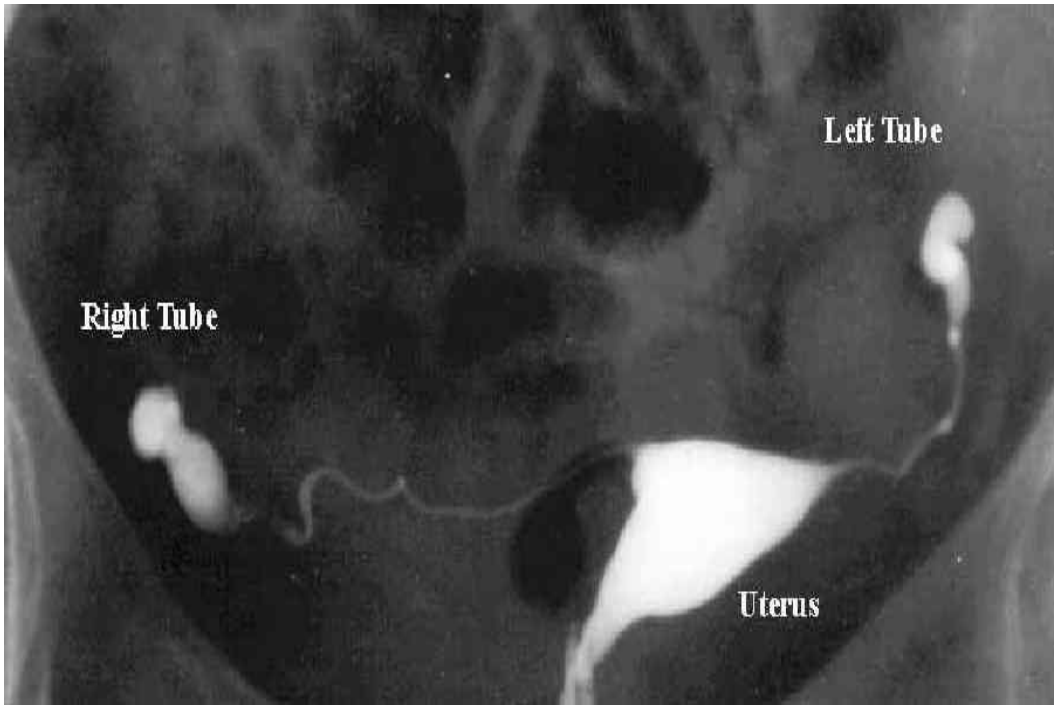

Laparoscopic Procedure
Laparoscope
Gas Filled Area
Uterus
Fallopian Tube
Ovary

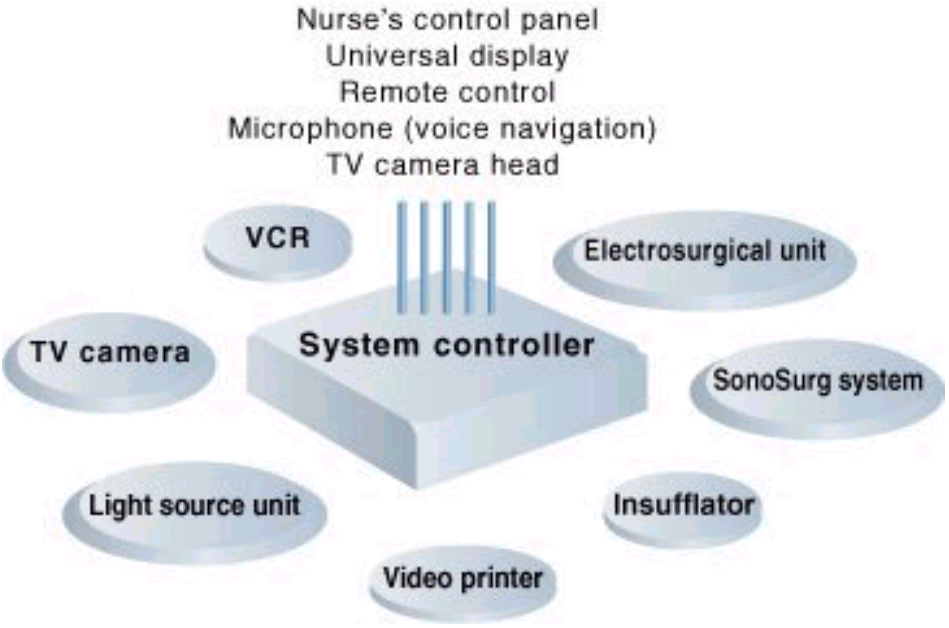
OVARIAN CYST

Normal hysterosalpingogram
A smooth triangular uterine cavity and spill from the ends of both tubes



Hsg showing normal uterine cavity and blocked tubes




Nurse's control panel
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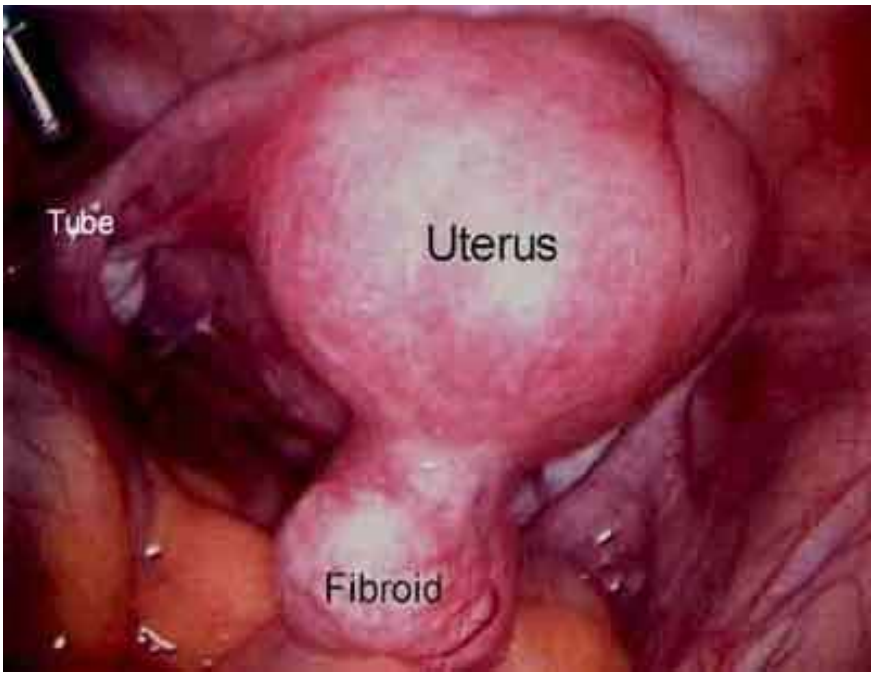

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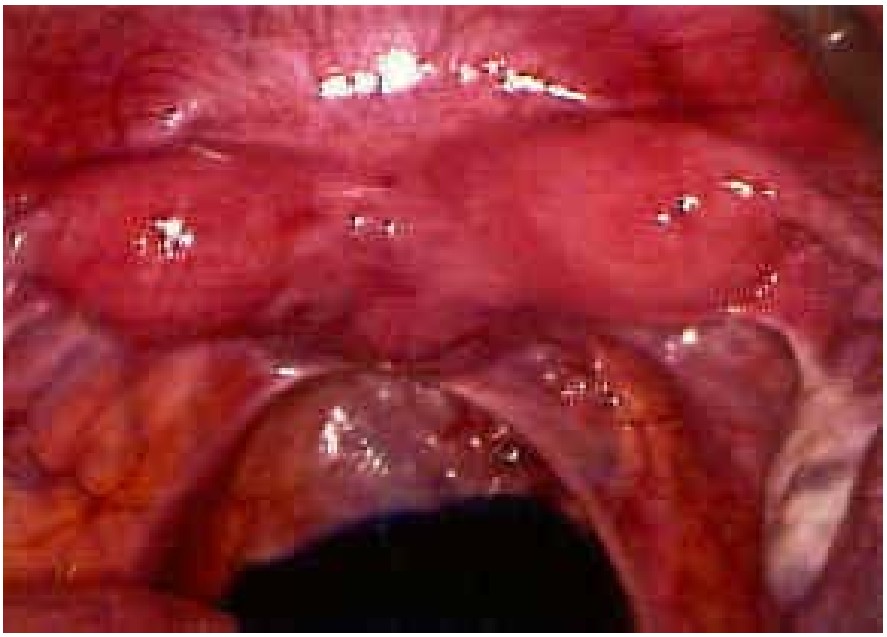

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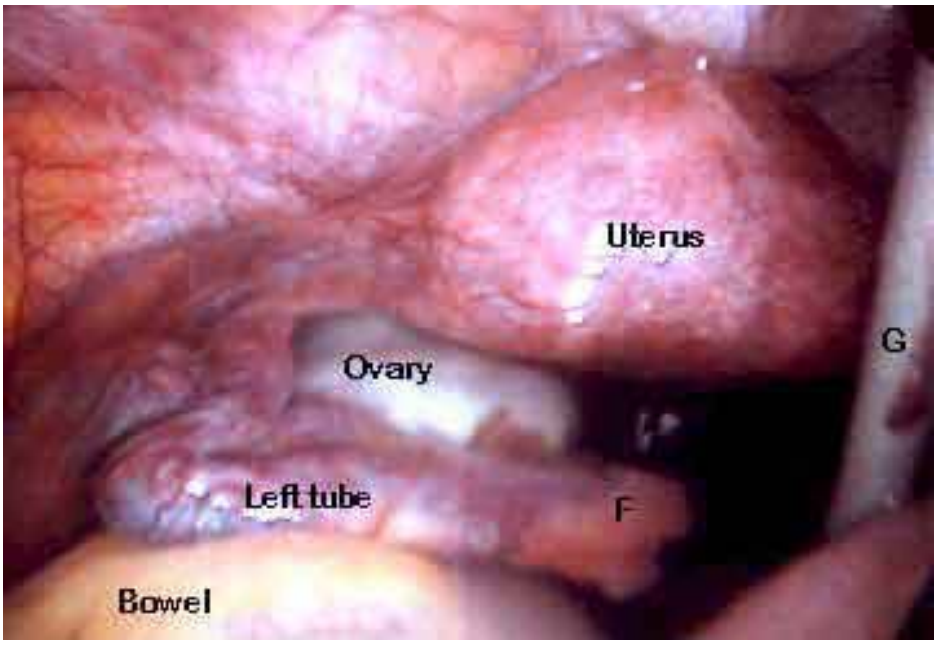

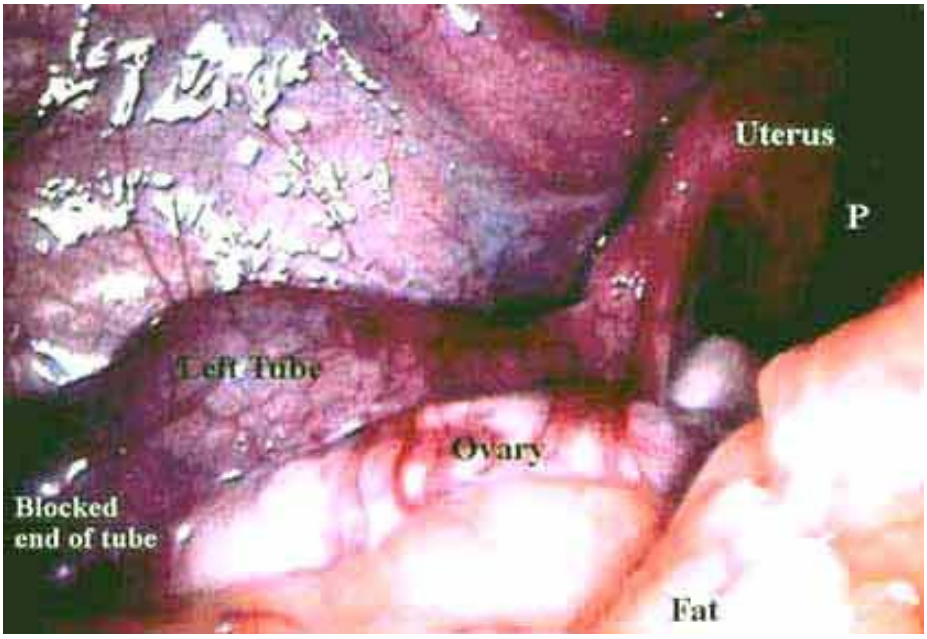

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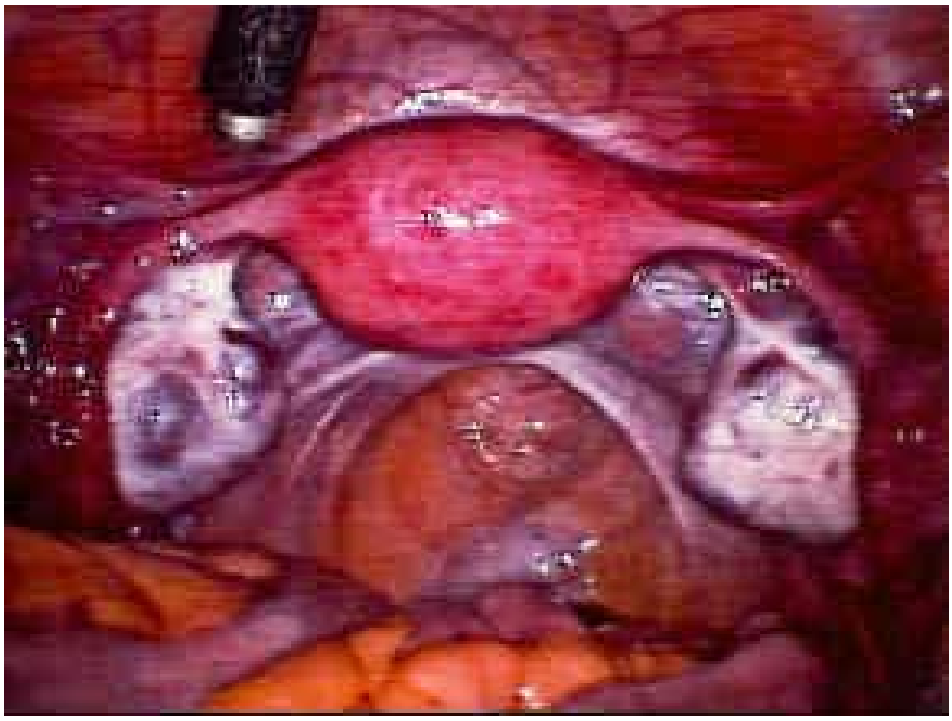

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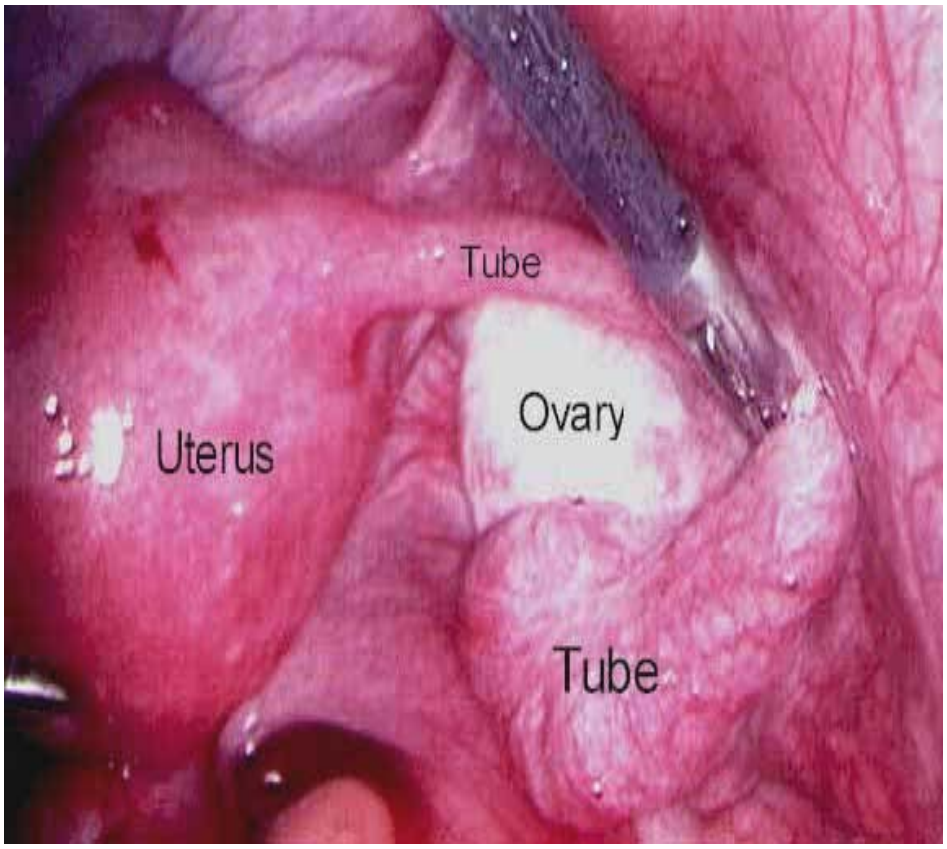

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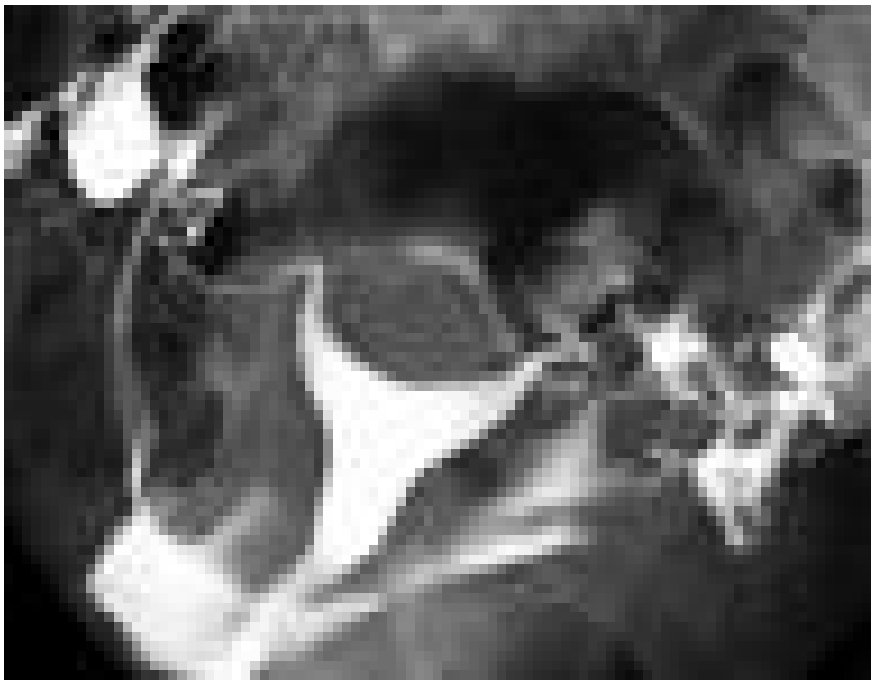

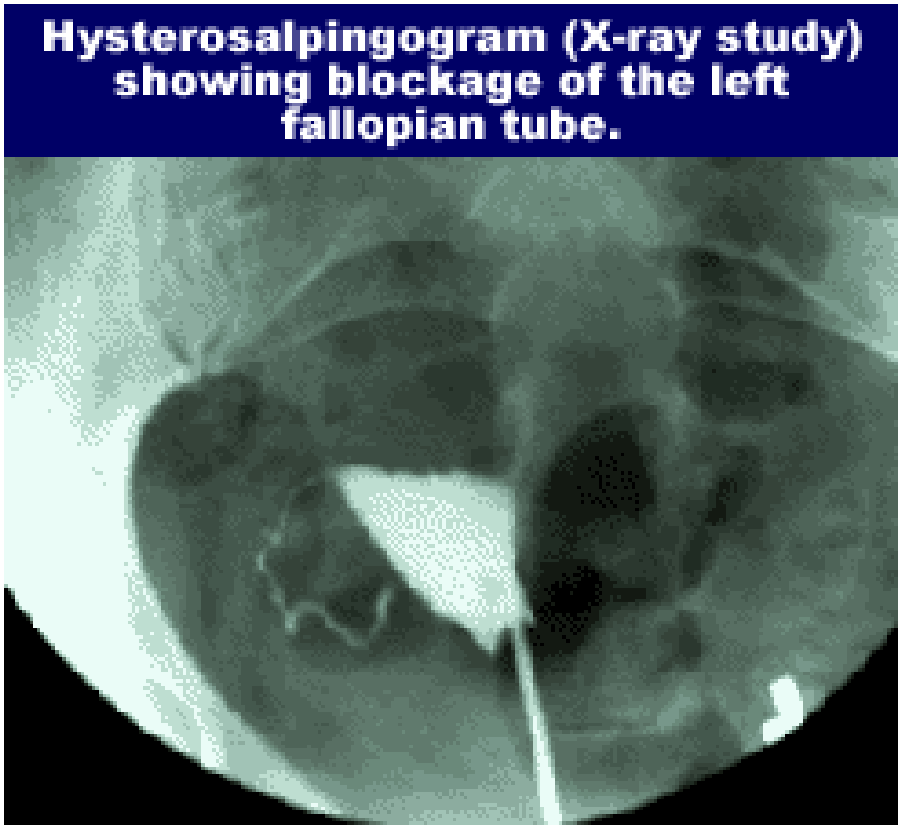

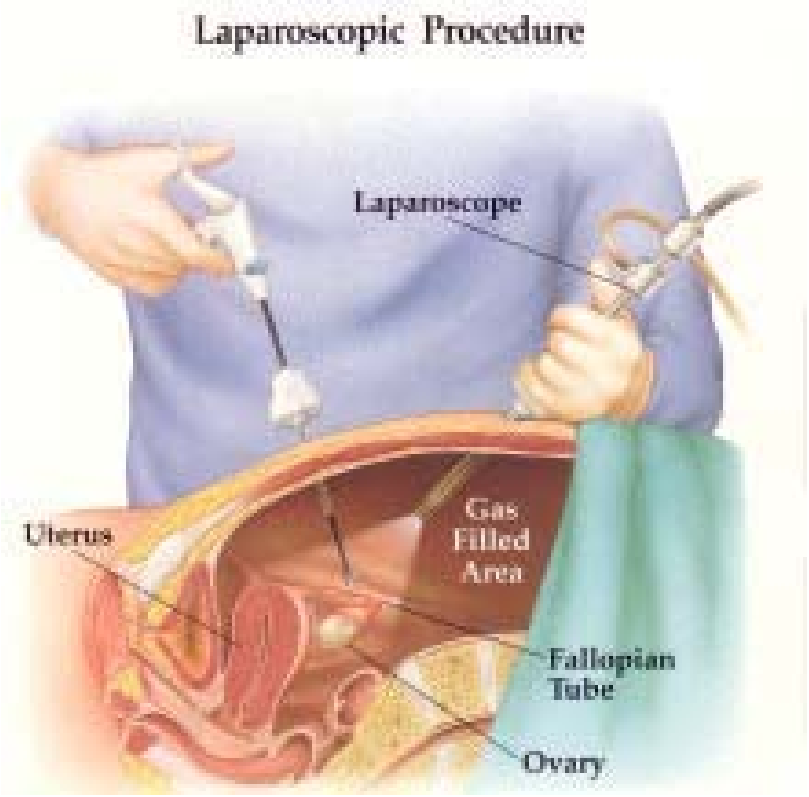
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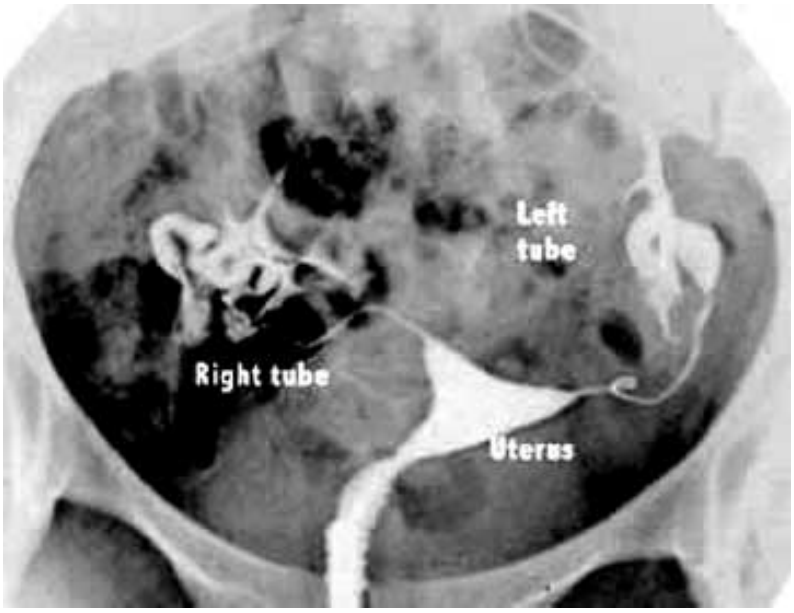

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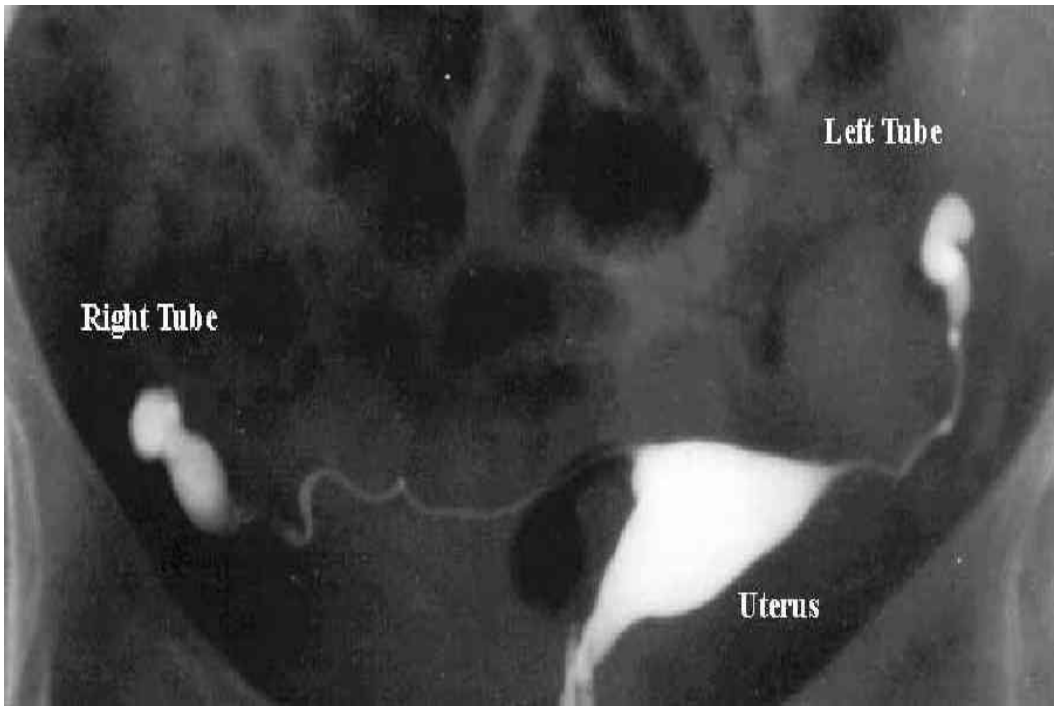

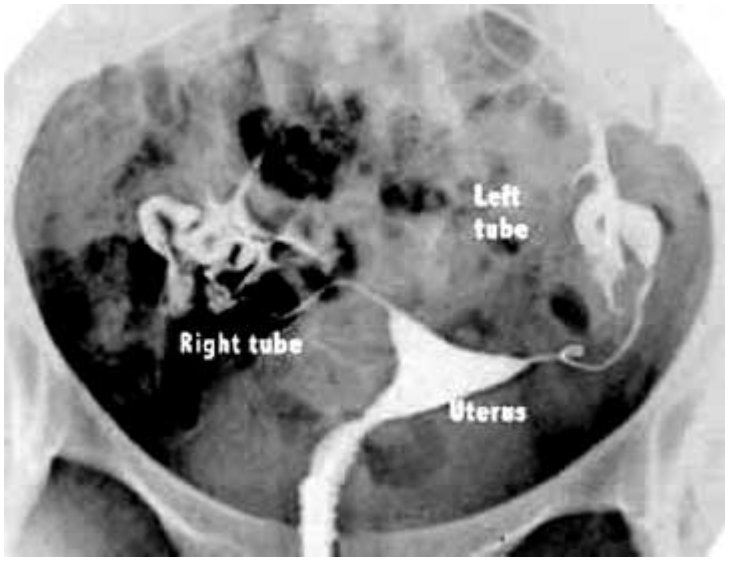

Normal hysterosalpingogram
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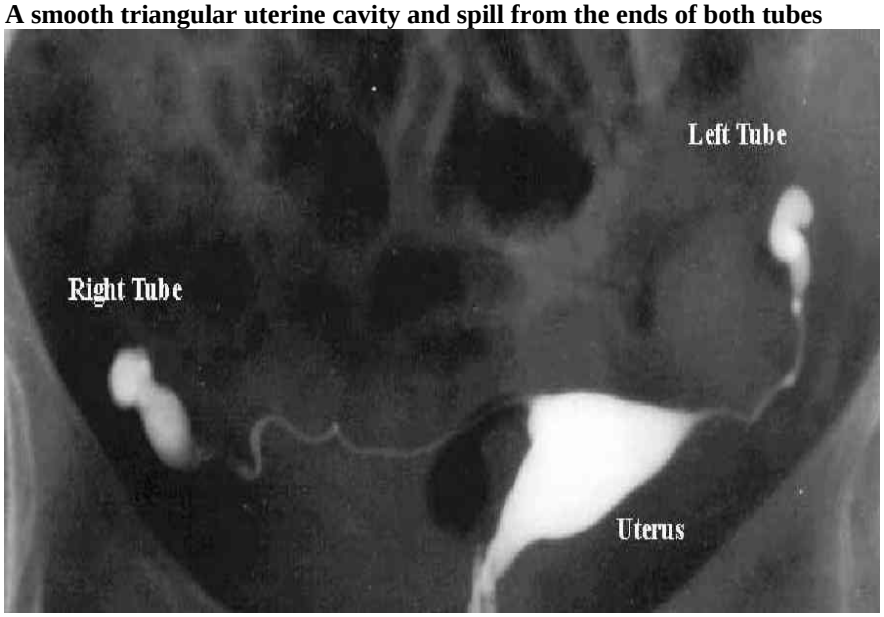

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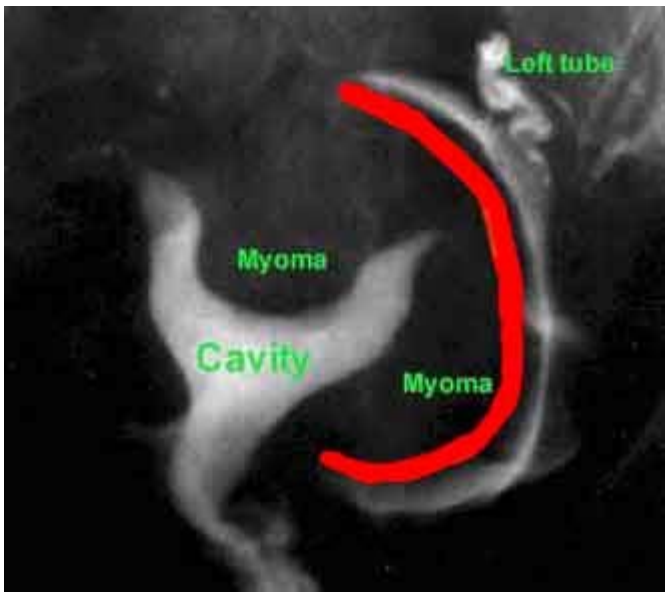
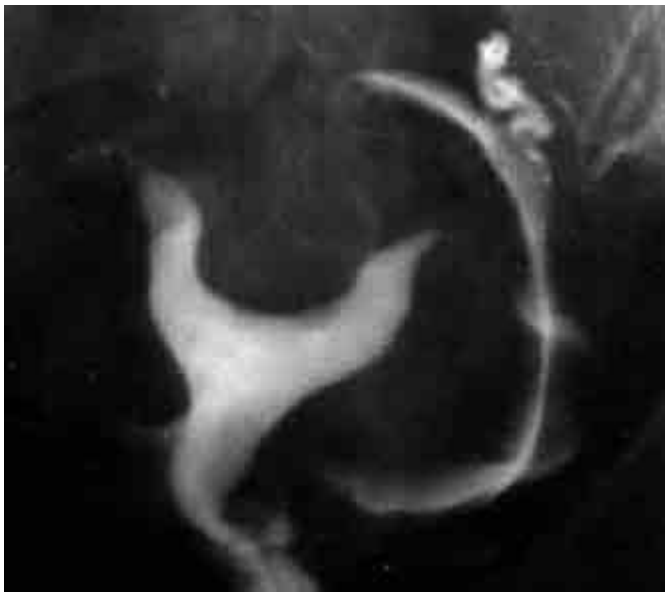
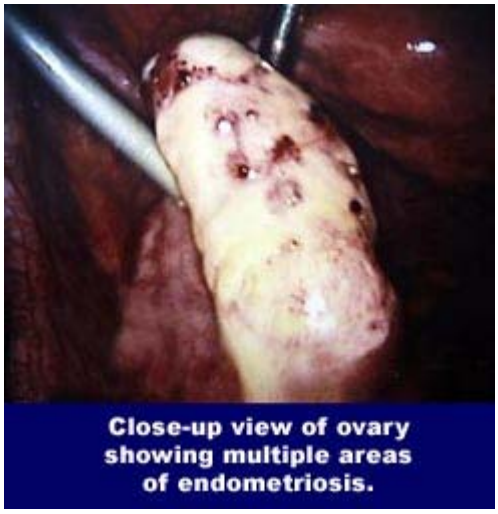


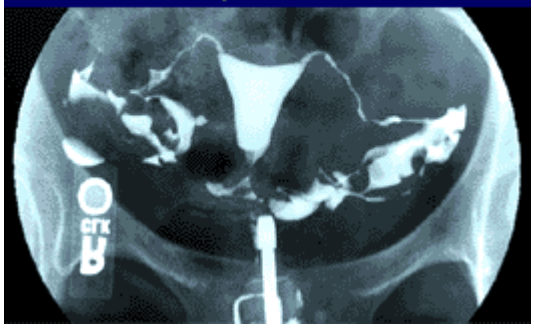


Hysterosalpingogram showing a uterus with a myoma that is pushing in to the cavity
Another myoma on the outside of the uterus is circumscribed by dye along the red line

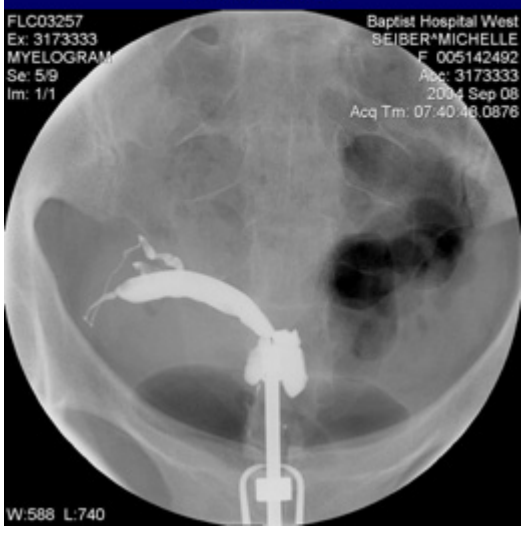


Close-up view of ovary showing multiple areas of endometriosis.

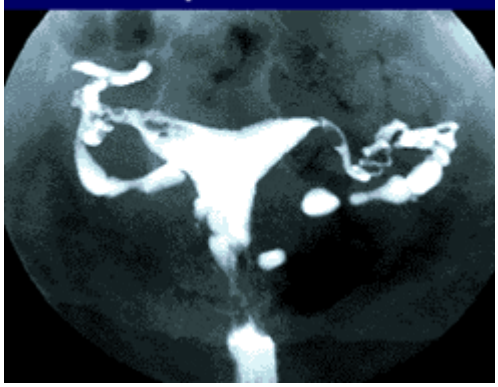
HSG (X-ray study after injection of contrast) showing a normal uterus and tubes, with dye flowing into the pelvis.



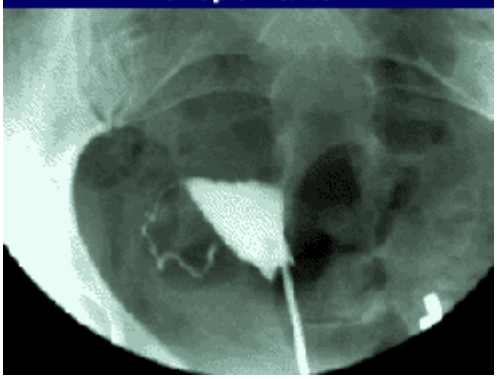
HSG showing a unicornuate uterus. This is an abnormal development wherein only 1/2 of the uterus forms. It is associated with miscarriages.



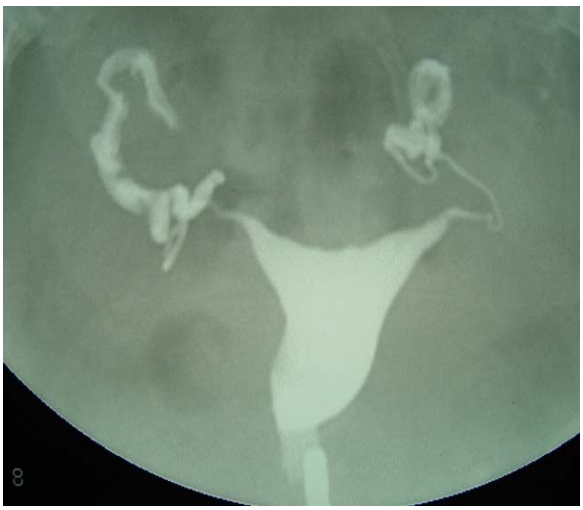
HSG (X-ray study) showing numerous endometrial polyps in the uterine cavity. These were easily removed through the hysterscope as an outpatient procedure.

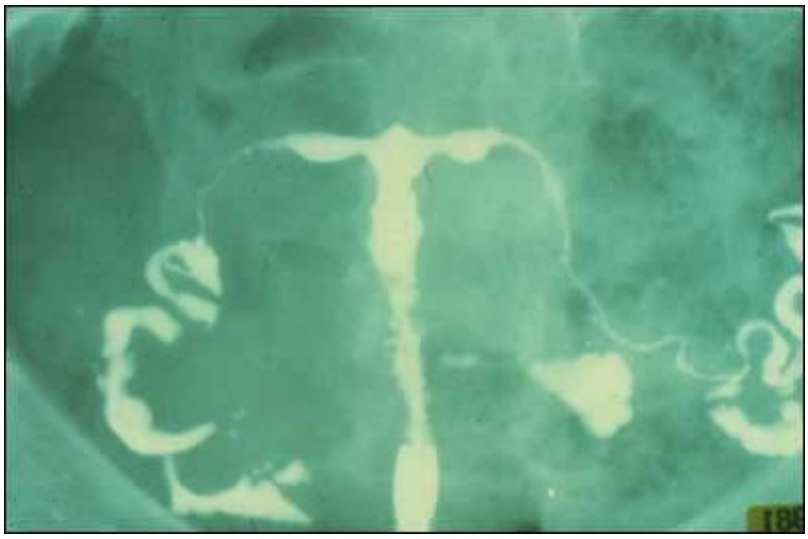


Hysterosalpingogram (X-ray study) showing blockage of the left fallopian tube.



Duplication of the uterine cavity seen in a patient with a septate uterus. This condition is easily repaired by an experienced surgeon.

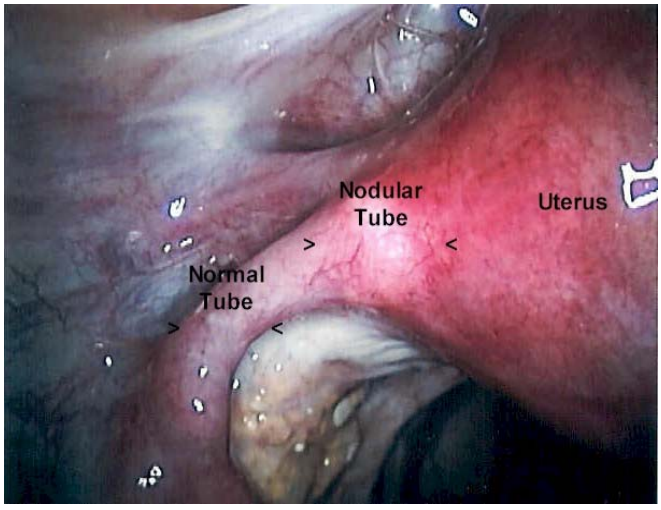


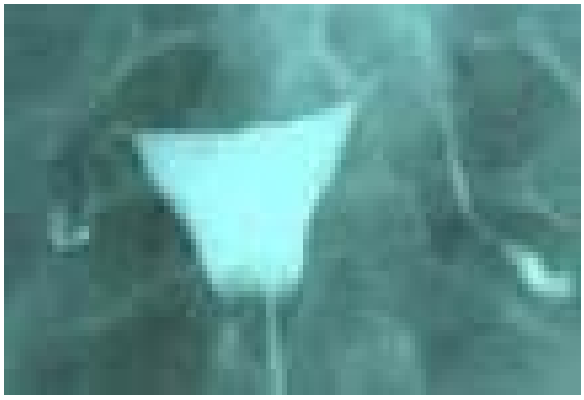


T shape uterus secondary to DES exposure

Blocked tube

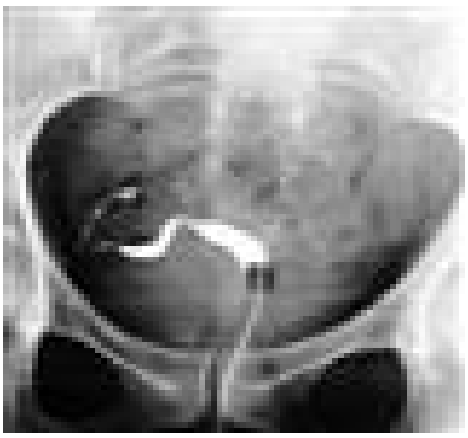
Salpingitis isthimic nodosa

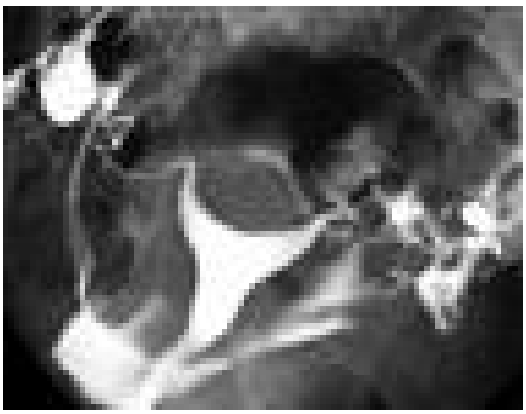


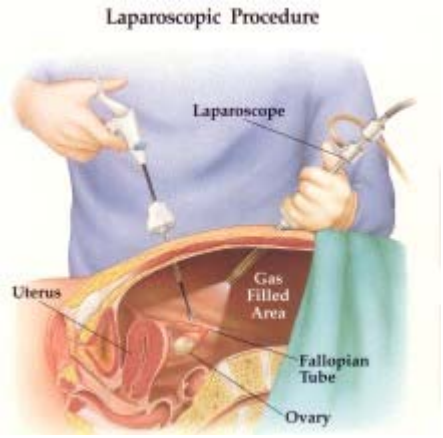


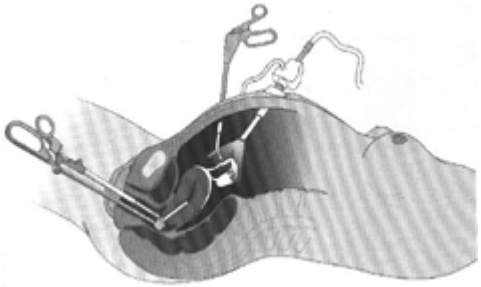
Unicornuate uterus

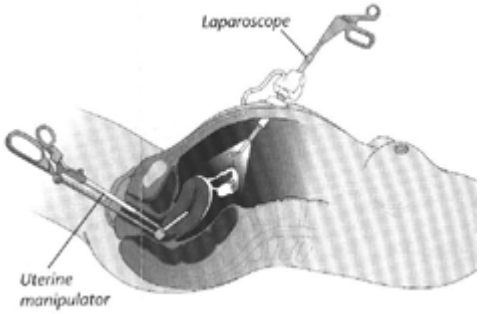
arcuate uterus



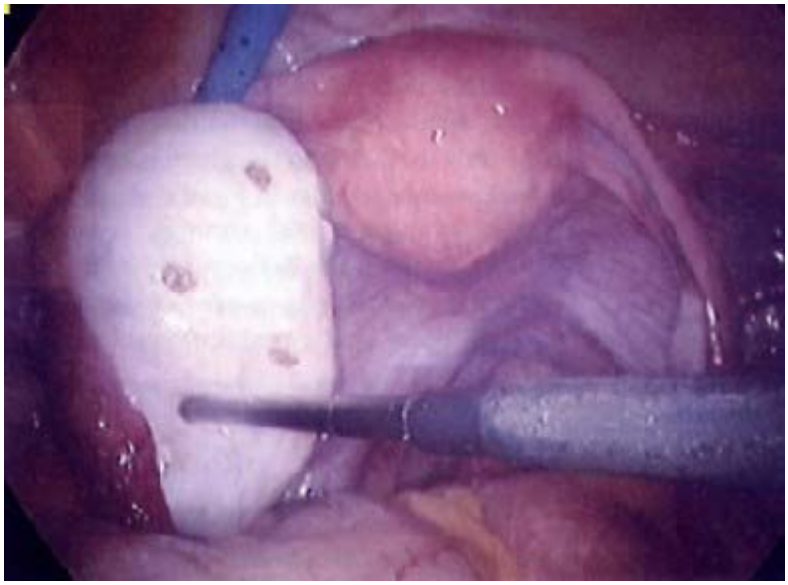



Laparoscopic Procedure
Laparoscope
Uterus
Gas Filled Area
Fallopian Tube
Ovary




Laparoscope
Uterine manipulator

PCOS



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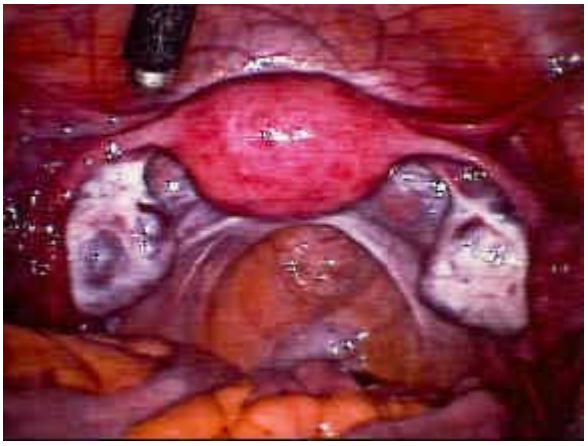

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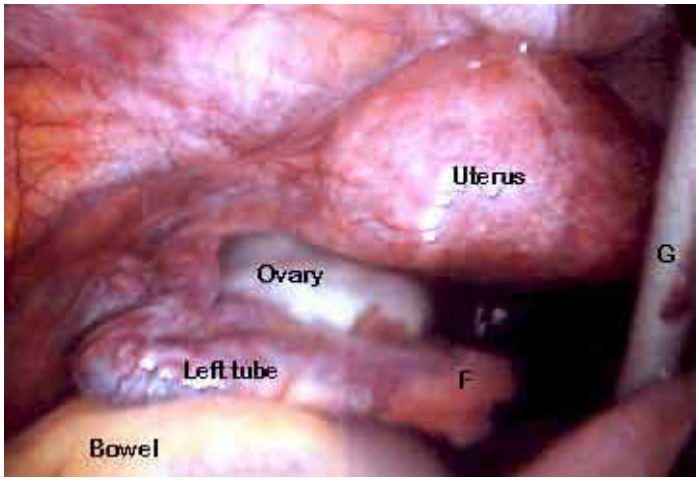
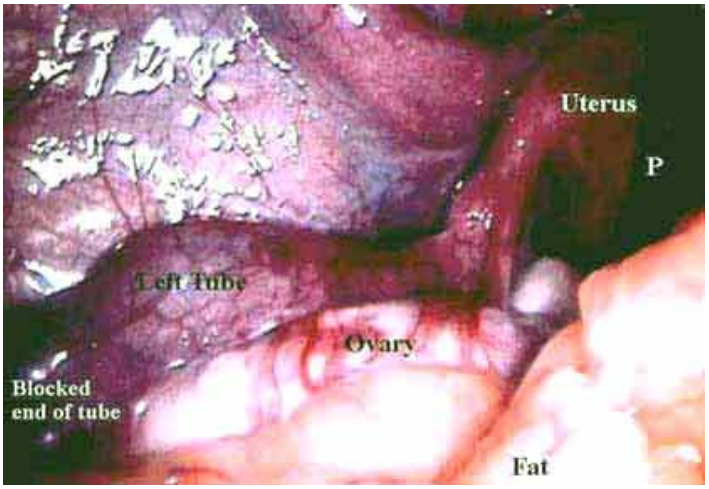
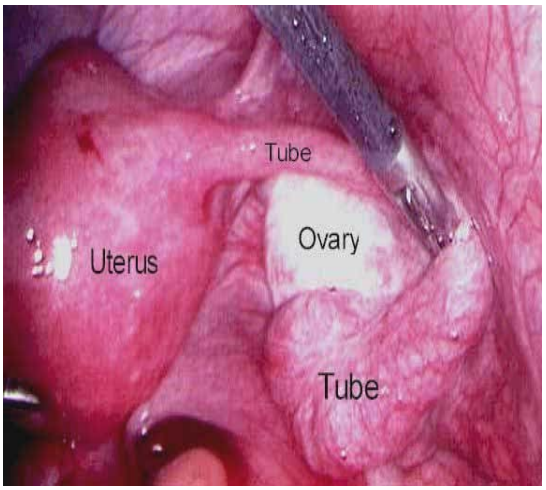
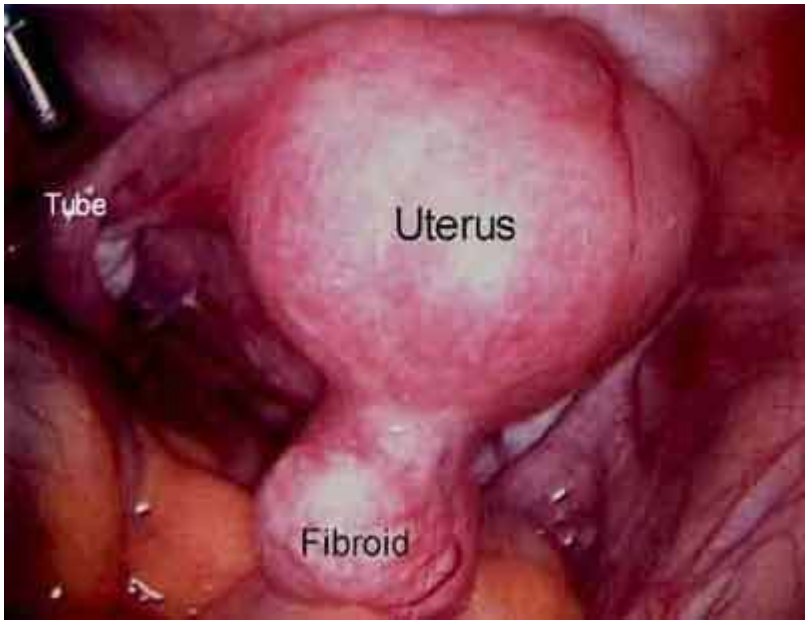


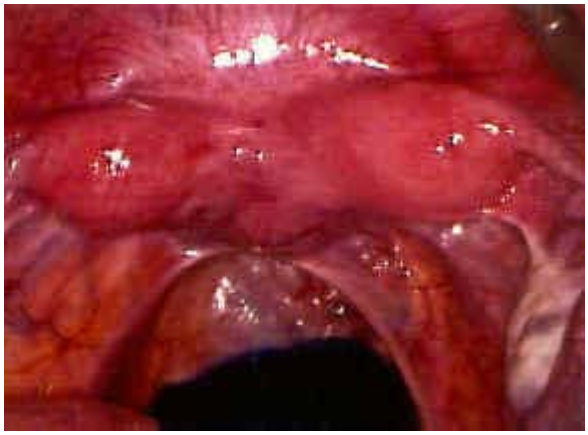


RIGHT TUBE BLOCKED AND STUCK IN SCAR TISSUE TO THE SIDE OF THE OVARY

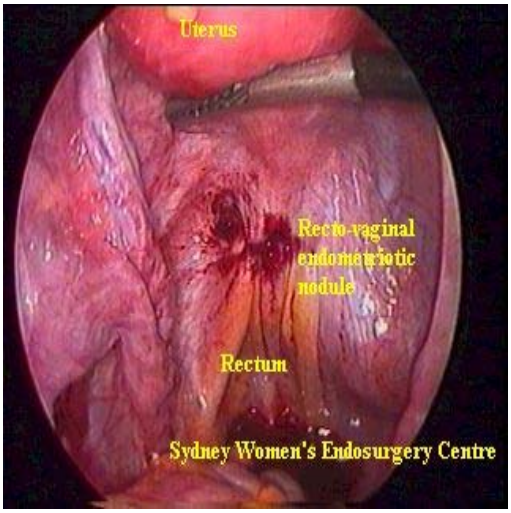




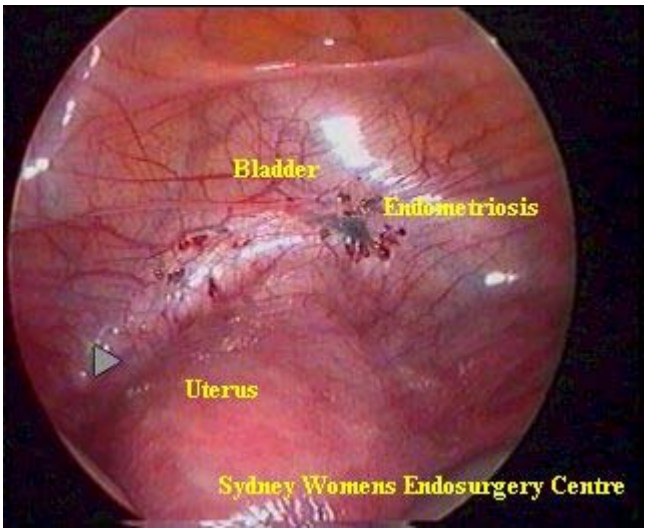
PEDUNCULATED POSTERIOR MYOMA

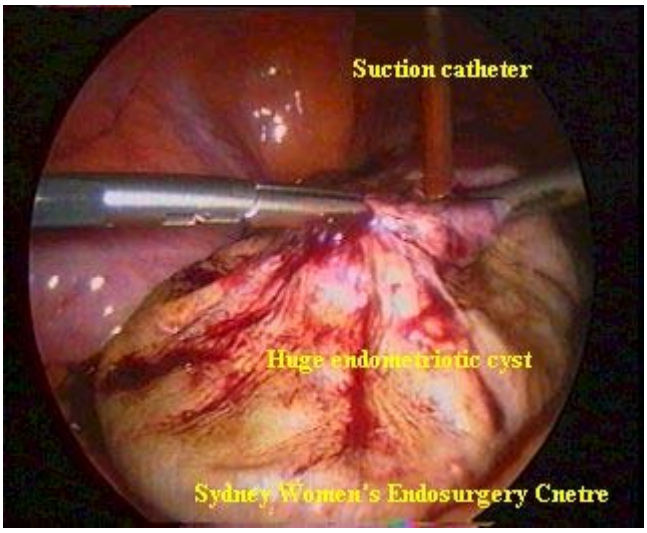


BICORNUATE UTERUS



ENLARGED POLYCYSTIC OVARY AFTER LAPAROSCOPIC CAUTERISATION


Bladder
Endometriosis
Uterus
Sydney Womens Endosurgery Centre


Suction catheter
Huge endometriotic cyst
Sydney Women's Endosurgery Cnetre


Ovarian endometriosis